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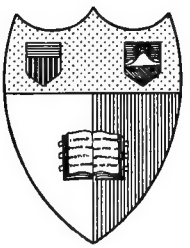

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History of British Ferns.

LONDON:
E. NEWMAN, PRINTER, 9, DEVONSHIRE STREET, BISHOPSGATE.

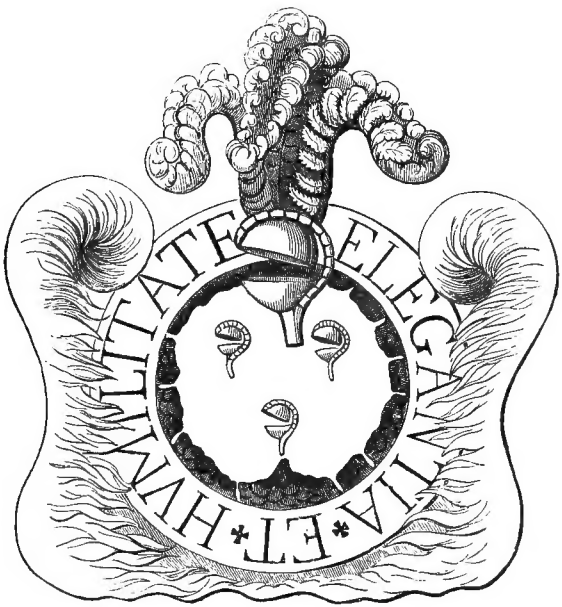
A

HISTORY OF BRITISH FERNS,

BY

EDWARD NEWMAN,

MEMBER OF THE IMPERIAL L. C. ACADEMY,
FELLOW OF THE LINNEAN, ZOOLOGICAL, AND BOTANICAL SOCIETIES,
PRESIDENT OF THE ENTOMOLOGICAL SOCIETY OF LONDON,
&c., &c., &c.



LONDON:
JOHN VAN VOORST, PATERNOSTER ROW.
M.DCCC.LIV.

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Monographers, come from whence they may, have, I think, fair pretence to challenge some regard and approbation from the lovers of Natural History; for as no man can alone investigate all the works of Nature, these partial writers may each in his department be more accurate in their discoveries and freer from errors than more general writers, and so by degrees may pave the way to an universal correct Natural History. — *Gilbert White.*

AS

A Tribute to the Memory

OF

John Ray,

WHOSE MATCHLESS TALENT FIRST ELUCIDATED

The British Ferns,

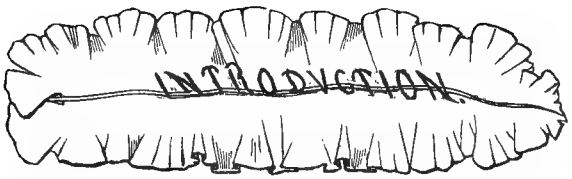
This Humble Monument,

INTENDED TO

Illustrate the Species,

IS ERECTED

By an Ardent Admirer.



Classification.

It is impossible for the candid mind to dwell for a moment on the fact that Britain produces only about one-fortieth part of the ferns already known as inhabiting the globe, without perceiving the impracticability of arranging that fractional part in anything like a connected series. Select one British species, Capillus-Veneris, for instance, and we shall find that there are at least a hundred exotic species which approach it more closely than any that occur in Britain: therefore, assuming that two thousand ascertained ferns constitute a connected chain, it follows that in Britain a hundred links are wanting at that part of the chain where Capillus-Veneris is situate. There is still another mode of accounting for some of the monstrous gaps observable in the chain of species. The physical changes perpetually occurring in the condition of the earth's surface, render large tracts of land incapable of sustaining any longer certain species which formerly hid the soil with their luxuriant foliage: we know that thousands of such species did exist, and do not exist; but that their history is preserved for ever in Geology, that glorious book whose pages are traced by Nature's own hand upon tablets of adamant. The hypothesis that Nature is compensating her losses by new

creations, requires the recommendation of proof. All our Floras tell a different tale. The links which once connected Equisetum to Chara or to Isoetes have since perished, and no others have been supplied; so that those genera stand alone and insulated, while all around them has disappeared: just as solitary specks of uninhabitable land, peeping up in the boundless ocean, are said to testify of a continent submerged. Whoever reads these circumstances aright, will fully appreciate the difficulty under which those are labouring who endeavour to build a system of such scanty materials. Deeply impressed with this difficulty, I have thought it better to preserve intact the arrangement which I originally proposed, than to attempt a new one; at the same time giving an outline of a plan which I believe more in accordance with Nature.

It may here be observed, that in the various systems proposed or indicated by general botanists, as Ray, Linneus, Antoine de Jussieu, Agardh, Perleb, Dumortier, Bartling, Hess, Schultz, Fries, Endlicher, Brongniart, Meisner, Adrian de Jussieu, and Lindley, there is a most evident tendency to depreciate, or rather to under-estimate, the flowerless plants. Whether they were called simply "flowerless," as by Ray; "Cryptogams," as by Linneus; "Acotyledons," as by the elder Jussieu and Decandolle; little has been done beyond the mere change of name. All these authors appear either to ignore or to disregard the extreme fallacy of divisions founded on a mere positive and negative. Nothing is more simple than the division of all plants into those which *have* flowers, and those which *have not:* but something more is required, for positive and negative characters might be made the basis of the most unnatural divisions.

Cuvier, in his 'Animal Kingdom,' a work unapproached, perhaps unapproachable, in its masterly and philosophical

grouping, has shown the plans on which all animals are constructed. He ignores the positive and negative of vertebrate and non-vertebrate, and employs positive characters only in defining his divisions; these are Vertebrates, Mollusks, Articulates, and Radiates: and a little reflection will convince any botanist that there are four great divisions of plants, equally capable of being distinguished by positive characters; these are Exogens, Endogens, Acrogens, and Thallogens.

Acrogens, in common with Thallogens, are without flowers; "nothing can be found which resembles the stamens and pistils of flowering plants:" they have usually distinct roots, stems, and leaves, the two halves of the latter being generally symmetrical; these characters serving at once to distinguish Acrogens from Sea-weeds, Lichens, or Fungi. Interesting as are the discoveries which Nägeli and his followers have made on the pro-embryo of ferns, and which I had the pleasure of introducing to the notice of British botanists (Phytol. iii. 613 and 925), their bearing on the diagnostic characters of Acrogens has been wholly misunderstood. Abundant evidence exists that there is in these discoveries no contradiction to the assertion, that Acrogens, so far as our researches have extended, are perfectly asexual.

Acrogens are either vascular and Pteridoid, or cellular and Mnioid: the first including all ferns and their allies, and the last, all mosses and their allies. The allies of ferns are Lycopodiums, Quill-worts, Pill-worts, Marsilias, Equisetums, and Charas: they have sometimes been called Cryptogamic Vasculares; but I prefer to define and divide them in the following manner, which, it will be observed, strikingly differs from the most popular and most recent arrangements. The division of the Filicales splits the universally received genera of Pteris, Polypodium, Asplenium, Davallia, and many others.

ACROGENÆ PTERIDOIDÆ, Pteridoid Acrogens, or Ferns and their allies, are plants of vascular structure, but which produce fruit without preliminary flowers: they may be divided thus: —

FILICALES have distinct leaves bearing one-celled capsules which are encircled by an elastic ring: they comprise: —

RHIZOPHYLLACEÆ, in which the leaves are attached to a rhizome or root.

CORMOPHYLLACEÆ, in which the leaves are attached to a cormus or trunk.

OSMUNDALES have distinct leaves and one-celled capsules detached from the leaves, and not encircled by an elastic ring: they comprise: —

OSMUNDACEÆ, in which the vernation of the leaves is circinate and the trunk woody.

OPHIOGLOSSACEÆ, in which the vernation of the leaves is straight and the trunk succulent.

LYCOPODIALES have distinct leaves and capsules divided by one or more septa: they comprise: —

MARSILIACEÆ, in which the capsules are attached to the rhizome or root.

LYCOPODIACEÆ, in which the capsules are seated in the axils of the leaves.

EQUISETALES have no leaves, but consist of an articulated branched stem: they comprise: —

EQUISETACEÆ, in which the fructification forms a terminal spike.

CHARACEÆ, in which the fructification is seated in the axils of the branches.

It will be seen that the divisions Rhizophyllaceæ and Cormophyllaceæ have a great similarity to those proposed by Mr. John Smith, of Kew, under the names of Eremobrya and

Desmobrya. I believe the idea of using this character as one upon which to found a primary division of the annulate ferns originated with myself, (see Phytol. ii. 273); but Mr. Smith was the first to apply the idea, and to name divisions founded on the differences pointed out. It must, however, be observed, that Mr. Smith, in his primary divisions, lays great stress on a character which now appears to me of somewhat secondary importance: I allude to the articulation of the stipes to the rhizome. My own conclusion, from a careful examination of the species within my reach, is, that the grand distinctive characters are these: — *First*, that the rhizome of the Rhizophyllaceæ, and the caudex of the Cormophyllaceæ, are not the same organ: that the rhizome is a root; the caudex a stem: that the rhizome never terminates in a frond; that the caudex always does: indeed, that its apex is constituted of fronds undeveloped; its trunk, of the bases of fronds that have decayed. *Secondly:* that the growing apex of a rhizome is always in advance of the fronds; that the fronds are always in advance of the growing apex of a caudex. There are two other and possibly less constant diagnostics: the rhizome of the Rhizophyllaceæ is scaly, the stipes naked; the caudex of the Cormophyllaceæ is naked, the stipes densely paleaceous: the formation of the fruit of the Rhizophyllaceæ follows the development of the frond; in the Cormophyllaceæ it precedes it. In some Cormophyllaceæ there is a tendency to approach the Rhizophyllaceæ: this is strikingly the case in Dryopteris, Phegopteris, and Thelypteris; but it is only necessary to examine the growing apex of the rhizomatiform caudex of these well-known ferns, in order to ascertain that it is always composed of undeveloped fronds. There is a plant familiar to every one who has a garden, that affords an illustration of the two modes of growth, — the common Pyrus japonica. The branches of this beautiful shrub always terminate in a bud, composed of undeveloped leaves; such branches, therefore, are analogous to the

caudex of a cormophyllaceous fern: the roots, on the contrary, spreading horizontally, and near the surface of the ground, never terminate in leaves, but possess the power of originating leaves and leaf-branches at any part of their surface except the growing apex; and not leaves only, but flowers also: such leaf-bearing roots are striking analogues of the rhizome of rhizophyllaceous ferns. Could we therefore divide a Pyrus japonica into branches and roots, we should have representatives of these divisions of ferns: the branches would be cormophyllaceous, the roots rhizophyllaceous.

Genera.

Concerning genera, I am well aware that I shall be regarded as going too far; and therefore a few words of explanation seem desirable. In the first place, it must be remarked that the proposed division of annulate ferns into two primary groups, by a character not previously employed, and a division which literally *halves* such genera as Polypodium, Pteris, and many others, necessitates the provision of a new name for one or both of the halves thus dissevered. Were it found that some of the species of Campanula were exogenous and some endogenous in structure, some alteration must be made, either in the classes or the genus. From this cause, the genera Ctenopteris, Eupteris, Lophodium, Gymnocarpium, and Pseudathyrium are proposed: three other generic names are introduced, because the Linnean specific name had been improperly, as I believe, transferred to the genus; these are Hemestheum, Phyllitis and Notolepeum. Lastrea montana and Dryopteris Filix-mas are respectively the types of Bory's genus Lastrea and Schott's genus Dryopteris: Lophodium is, I believe, strictly synonymous with the Linnean species Polypodium cristatum; the name is intended as a Greco-Latin version of the word

cristatum. The numerous species of Lophodium have hitherto formed part of what might be called the *retenue* of Polypodium, Polystichum, Aspidium, Nephrodium and Lastrea, but have never, as I believe, constituted a genus: it is surprising that the flat, notched involucre of this genus did not attract the attention of those botanists who have treated of that organ as being so important. The other genera are, I believe, generally received.

Species.

Without going back to Gerarde, Parkinson, and that ancient school of herbalists, it will be sufficient to begin a summary of the species of British ferns with Ray's 'Synopsis.' In this admirable work, no less than forty-eight species are enumerated. I omit twelve of them: — 1. Polypodium murale, which, as the editor distinctly explains, is only a variety of Polypodium vulgare, figured at p. 41. 2. Polypodium Cambrobritannicum, the well-known *var.* Cambricum of the same plant, figured at p. 45. 3. Trichomanes foliis eleganter incisis, is the variety of Asplenium Trichomanes figured at p. 252. 4. Filix aculeata major, is one of the forms of Polystichum aculeatum, figured at p. 111. 5. Filix Lonchitidi affinis is represented at figure *b* on the same page. 6. Filix pumila saxatilis is the seedling plant of my Lastrea montana, p. 129. 7. Adiantum, an album tenuifolium, which Dillenius considered a variety of Ruta-muraria. 8. Adiantum majus Coriandri, &c., and 9. Adianto vero affinis, both of which are forms of Asplenium marinum. 10. Filix lobata, which is a leaf of Anemone nemorosa. 11. Adiantum nigrum pinnulis Cicutariæ, which I believe to be the divided and acute form of fragile, represented in the left-hand figure at p. 87. And 12. Filix pumila petræa, which I agree with the editor in supposing a young plant of

Asplenium Adiantum-nigrum. The remaining thirty-six I retain, and have distinguished them by the letter R in the following list.

In the 'English Flora,' Sir J. E. Smith adds nine species: of these I omit four, — Aspidium spinulosum, Aspidium dumetorum, Aspidium irriguum, and Cystopteris dentata, — because they appear to me to have no claim whatever to be mentioned even as varieties; two, namely, Cystopteris regia and Asplenium fontanum, because they have only been found on garden-walls: and I retain three, — Polypodium calcareum, Aspidium cristatum, and Asplenium alternifolium, — under other names, and have distinguished them by the letter S in the following list.

In the 'British Flora,' Sir William Hooker makes two additions, — Aspidium rigidum and Hymenophyllum Wilsoni, — which, under other names, I retain, and distinguish by the letter H in the following list.

In the various editions of this work I have added nine other species, and these are distinguished by the letter N.

ALPHABETICAL LIST OF SPECIES.

Aculeatum, R.
† Acutum, R.
Adiantum-nigrum, R.
Alpestre, N.
*Alpina, R.
† Angulare, R.
Aquilina, R.
Callipteris, S.
Capillus-Veneris, R.
Ceterach, R.
† Collinum, N.
Crispus, R.
*Dickieana, N.
Dryopteris, R.
Filix-mas, R.
Filix-femina, R.
Flexile, N.
Fœnisecii, R.
Fragile, R.
† Germanicum, S.
† Glandulosum, N.
Ilvensis, R.
Lanceolatum, R.
Leptophylla, N.
Lonchitis, R.
Lunaria, R.
*Lusitanicum, N.
Marinum, R.
Montana, R.
Multiflorum, R.

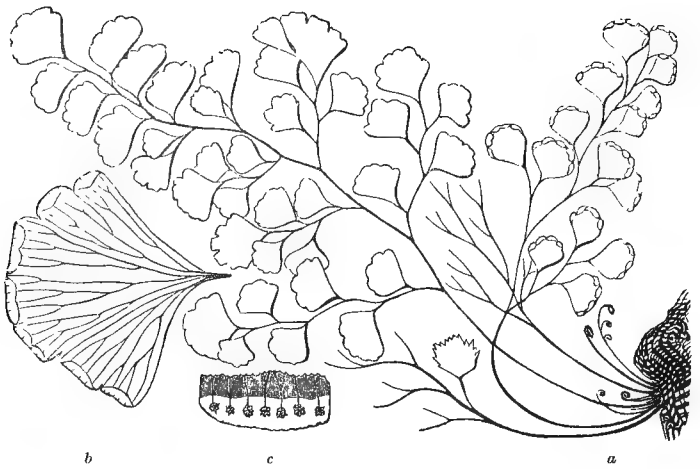
Myrrhidifolium, R.	Ruta-muraria, R.	Tunbridgense, R
Phegopteris, R.	Scolopendrium, R.	† Uliginosum, N.
Radicans, R.	Septentrionale, R.	*Unilaterale, H.
Regalis, R.	Spicant, R.	Viride, R.
Rigidum, H.	Spinosum, N.	Vulgatum, R.
Robertianum, S.	Thelypteris, R.	Vulgare, R.
† Rutaceum, R.	Trichomanes, R.	

There is scarcely anything so difficult to define as a species. We all agree that it has an existence in Nature, but we are at a loss for terms of definition, that shall be at once sufficiently restrictive and sufficiently comprehensive. And another difficulty exists against which it is next to impossible to contend, and that is, the different modes in which different minds view the same object. No plant ever displayed this difference more prominently than Fœnisecii: some minds look on this as the *most distinct* of ferns; others, myself for instance, regard it as taking an *ordinary station* as a species, like lanceolatum, Trichomanes, viride or marinum; others, again, as the learned authors of the sixth edition of the 'British Flora,' not only omit it from their list, but feel themselves called on to devote fifty-six lines of their smallest type to explanations, as though it must be argued away at any cost of space and trouble. I will not say that either of these is wrong; but I do say that such a discrepancy of opinion on what appears a very simple question, shows the simplicity is one of seeming only.

Amongst the ferns I have described, there are certain indescribable grades of rank. Those which I regard of the highest rank, stand in the preceding list without any prefix. A grade lower than these, are others to which I prefix an asterisk: — Woodsia *alpina, Cystopteris *Dickieana, Ophioglossum *lusitanicum, and Hymenophyllum *unilaterale; but all these stand as established species in the text, without any mark of doubt:

each commences on a right-hand page, and each has the English name below the figure: the doubts respecting these four are expressed in the text. A grade lower still in the scale of importance are seven others, which are distinguished by a dagger: these are Asplenium †acutum, Polystichum †angulare, Lophodium †collinum, Amesium †germanicum, Lophodium †glandulosum, Botrychium †rutaceum, and Lophodium †uliginosum: these are distinguished in the text by a dagger prefixed to the English name, and by the English name always, and a portion of the text often, preceding the figure. The lowest grade bearing generic and specific names, comprises such forms as Dryopteris affinis, Dryopteris Borreri, and Dryopteris abbreviata, all placed under D. Filix-mas; Athyrium molle, Athyrium convexum, and Athyrium incisum, all placed under A. Filix-femina.

The names of species are intended to be in strict accordance with the law of priority. Alpina of Bolton is prior to hyperborea of Liljeblad; Ceterach of Linneus is prior to officinarum of Willdenow; Fœnisecii of Lowe is prior to recurvum of Bree; germanicum of Weiss is prior to alternifolium of Wulfen; montana of Vogler is prior to Oreopteris of Ehrhart; Myrrhidifolium of Villars is prior to montanum of Allioni; Allioni, moreover, had no right to introduce a second Polypodium montanum: radicans of Swartz is prior to speciosum of Willdenow; Robertianum of Hoffmann is prior to calcareum of Smith; Scolopendrium of Linneus is prior to vulgare of Symons, (alas, what a falling off was here!); Spicant of Linneus is prior to boreale of Swartz; and unilaterale of Willdenow is prior to Wilsoni of Hooker. Botanists will adopt these names or not, at their option: I endeavour to point out the right path, but have neither the power nor the inclination to compel others to take it.



TRUE MAIDENHAIR, (*natural size*).

Characters.

Genus. — ADIANTUM. Ultimate divisions of frond stipitate, leaf-like, without a midvein: veins variously branched, free at the extremity: involucre not apparent: clusters of capsules nearly circular, seated on the reflexed bleached margin of frond.

Species.—CAPILLUS-VENERIS. Stipes black, about the same length as the frond: frond deltoid, lax, irregular: pinnæ alternate, stipitate, irregularly pinnate: pinnules stalked, leaf-like, generally subrhomboid.

Synonymes, Figures, &c.

Adiantum Capillus-Veneris, *Linn. Sp. Pl.* 1559; *Lightf. Fl. Scot.* 679; *Huds. Fl. Ang.* 460; *Bolt. Fil. Brit.* 24, t. 29; *With. Arr.* 781; *Sm. E. F.* iv. 320, *E. B.* 1564; *Mack. Fl. Hib.* 344; *Franc.* 59, t. vi. f. 3; *Newm. N. A.* 9, *F.* 83; *Hook. and Arn.* 576; *Bab.* 416; *Moore*, 196.

Botanists are agreed on the name of this fern, and the figures are generally characteristic.

Geographical Range.

The geographical range of this species is very wide, extending over the middle and south of Europe, the islands of the Mediterranean, the north of Africa, the Canary and Cape de Verd Islands; and forms so similar as scarcely to admit a doubt of their identity, occur in nearly every tropical or temperate country yet visited by botanists. Sir William Hooker, in his 'Species Filicum' (ii. 36), gives the following Asiatic, Oceanic, and American localities: — "Throughout the East Indies, but chiefly in damp hilly districts, Malabar, Nepal, Kamaoun, &c. Assam, Khasya, Boutan, Scinde. Mauritius, Bourbon, Madagascar. China. South Africa, Algoa Bay, Uitenhage. Sandwich Islands. Throughout the temperate parts of North America, East and West side. Guatemala. Mexico. Trinidad. Dominica. Jamaica." In Britain, it is one of our most local and most beautiful ferns: it always occurs in moist caves, or in the fissures of rocks, near the sea-coast, preferring a perpendicular surface, whence its delicate fronds grow in a nearly horizontal direction, inclining upwards at the extremity. It seems particularly to delight in localities where water trickles down the surface of the rock.

Cornwall. — I am indebted to Miss J. M. Fox for a living plant from Carclew, the seat of Sir C. Lemon, where it grows abundantly. Mr. Ralfs informs me he found it on cliffs within reach of the sea-spray, between St. Ives and Hayle; and Mr. H. C. Watson gives me St. Ives as a habitat, on the authority of the Rev. J. S. Tozer, and Carrick Gladden, a sea-cave in the same vicinity, on the authority of the Rev. Jas. Harris. I have many other authorities for each of these stations.

Devonshire. — I am indebted to Mr. Ward for specimens from the vicinity of Ilfracombe: he found it growing luxuriantly on the face and in the vertical crevice of a rock in White Pebble Bay, in a dense mass, which commences at a height of about twenty-five feet, and descends to within about five feet of the level of the sea; he also observed it at Rillidge Point, and two other stations in the same neighbourhood. Mr. Edwin Lees has obligingly sent me specimens from the same localities: he found it in great abundance in September, 1843: in every instance the fern was growing in gulleys of the cliff, where little rills of fresh water dribble down from above, depositing a travertine sediment. Mr. J. Buckman, of Cheltenham, has

kindly transmitted Ilfracombe specimens. I have also to acknowledge my obligation to the Botanical Society of London, for specimens from Ilfracombe, collected by Dr. J. E. Gray, of the British Museum. Miss A. Griffiths informs me it has been found at Watermouth, also on the north coast; the Rev. W. S. Hore adds that it has lately been discovered near Brixham, on the south coast of Devonshire, by Mr. Bartlett; and Mr. T. B. Flower has recently sent me specimens, gathered by himself at Mudstone or Mewstone Bay, near Berry Head, (see Phytol. iii. 51).

Glamorganshire. — Miss M. Waring informs me that she obtained specimens from rocks at Dunraven, in Glamorganshire; and Mr. Dillwyn observes that it is common on the cliffs of lias at the eastern end of the county, but that he has not seen it on mountain limestone, or nearer to Swansea than Dunraven, (Phytol. i. 183). I have seen specimens from Barry Island, off the same coast; and this, as well as Port Kerig, have been given in all our Floras as localities. The Dunraven station is thus described by my brother, Henry Newman, who paid it a visit in 1853: — "Let the botanist leave the South Wales rail at Bridgend station, and walk six miles to Southerndown, a cluster of houses, with an inn, on the side of the Bristol Channel. Arrived here, let him make for a sandy beach close to the lodge-gate of the Dunraven estate, where it assumes the form of a little bay; following the bank or cliff to the left, and walking along its base, he will in a few minutes perceive the fern covering the face of the cliff where a rill comes trickling over its surface, and leaving a deposit of lime, in appearance and consistence much like cream-cheese: this is very soft on the surface, but harder underneath: out of this queer substance grows the Maidenhair, very small in size, very abundant, entirely unprotected, and in constant motion as the sea-breezes sweep over it."

Somersetshire.—"Said to grow at the mouth of an old well at Clevedon," — Mr. L. H. Grindon, in Phytol. i. 964. "I found three plants of this fern growing in the air-shaft of a stone-quarry some thirty feet below ground, at Comb Down, near Bath,"—Mr. E. J. Lowe, in Phytol. iv. 1000.

(Shropshire. — In the 'Phytologist' (i. 579) appears the following announcement by Mr. Westcott: — "About sixteen years ago I found Adiantum Capillus-Veneris on the Clee Hill, Titterstone. It was growing among the stones on the ascent to the group of rocks called the Giant's Chair. I plucked a piece of it as a specimen, and placed it in my book, leaving the root. This specimen I kept by me for some time, but at last it was lost, and of the loss I took no notice, not doubting that the next time I visited the spot I should again find the plant. However, I have hitherto been unsuccessful in my researches; but it would be well if some one would diligently search for it, and perhaps it may again be discovered.")

Isle of Man.—We find it mentioned in Lightfoot's 'Flora Scotica' as a native of the Isle of Man; but this locality appears to have been little

regarded, indeed it had sunk into oblivion, when we were favoured by a corroborative statement of the fact by the Rev. F. F. Clark, (Phytol. i. 89). From this gentleman we learn that the locality was rediscovered by Dr. Wood, of Cork, in or about 1809, and by himself in 1835 and 1840. In the latter year he thought it nearly exterminated, but Mr. T. G. Rylands again observed the plant in Glen Meay, in 1841: he found young plants in tolerable abundance, mixed with more mature ones, although it required close examination to discover the roots when the fronds were gone; the finest root was high above a water-fall, and perfectly inaccessible, so that he considers its extermination highly improbable. I am indebted to Mr. Wilson for cultivated specimens, from a root brought by Mr. Rylands from this locality.

(Scotland.—In Lightfoot's 'Flora Scotica' we find this record:—"Dr. Sibthorpe, the present most obliging Professor of Botany, at Oxford, favoured me with the sight of a large and perfect specimen of this fern, in the copious herbarium preserved at the Physic Garden in that University, to which specimen a label was annexed, with this inscription, 'From the isle of Arran, near Galloway, from Mr. Stonestreet.' The specimen is to be found among the ferns. — *Lib.* 3, *p.* 3, *f.* 3." — (Flor. Scot. ii. 679). This statement is now universally believed to be an error, and to refer to the isles of Arran near Galway, on the west coast of Ireland. The other Scotch station, "by the Carron, in Kincardineshire," given in Hooker and Arnott's 'British Flora' (576), also appears to be erroneous.)

Ireland.—I am indebted to Mr. Mackay, of the College Botanic Garden, for a specimen from the south isles of Arran, where he found it in profusion, growing in small fissures of limestone rocks, but never rising above the fissures, therefore varying in length of frond in proportion to the depth of the fissure. Mr. W. Andrews found it sparingly on the Cahir Conree mountain, near Tralee; and the late Mr. J. M'Alla, an industrious young botanist, who resided at Roundstone, in Connemara, found a few plants at the foot of a rock facing south-west, on the banks of Lough Bulard, near Urrisbeg. Very abundant and luxuriant on the coast of Clare, near Ballyvaughan: "about four or five miles from Ballyvaughan, the line of shore subsides into what in Yorkshire is called 'limestone pavement,' the chinks and chasms of this are in some places literally filled with Asplenium marinum, and in others with Adiantum Capillus-Veneris, the fronds of the latter usually coming up to the surface-level, and measuring certainly 16 to 18 inches in length. The station extends westward from Ballyvaughan, round Black Head, to Cremlin Point." — Mr. W. Bennett, in Phytol. iv. 1120.

Description.

The roots are wiry, black, and fibrous: the rhizoma, or under-ground stem, is black and scaly, and creeping, though very slowly: the young fronds make their appearance in May, are fully developed in July, and remain green till the winter: the future divisions of the frond are not apparent on its first expanding; three or five pinnæ only appear, and these, in a few days, become divided into pinnules.

Although the form of the frond has been repeatedly described by botanists in precise terms, it must be considered irregular. The rachis, or principal stem, is throughout naked, shining, and nearly black; the branches, or pinnæ, are alternate, and on these are the pinnules, also alternate, and each on a distinct footstalk: botanists describe these pinnules as wedge-shaped, or fan-shaped, but they are far from uniform, and often vary greatly in the same frond. The fronds are generally fertile, the exterior margin of each pinnule being divided into a number of lobes, and the terminal portion of these is bleached, scale-like, reflexed, and bears the capsules of seed in somewhat circular clusters on its internal surface: this reflexed margin, and also the situation of the veins, is shown in the detached pinnule (fig. *b*), to the left of the cut at page 1: the veins divide frequently, and without regularity, and run into the bleached reflexed portion of the lobe, ceasing before its extreme margin, and each bearing a cluster of capsules at its extremity; this will be seen on reference to the lower figure in the same cut (fig. *c*), which represents only one lobe or division of a pinnule: the reflexed portion, turned back, and showing the clusters of capsules, is unshaded. When barren, the margins, instead of being bleached and reflexed, are continued on the same plane as the disk of the pinnule, are sharply serrated (as represented in the annexed figure), and perfectly green to the extremity: with this exception, the fertile and barren fronds are similar. When the frond has passed maturity, and approaches decay, the pinnules of this fern fall off like the leaves of phænogamous plants, the rachis remaining

bare and leafless, and assuming the appearance of a bunch of strong bristles.

Mr. Ball, of Dublin, pointed out to me a property which this fern possesses, when cultivated on Mr. Ward's plan of checking communication with the outer air by means of a glass cover: — the lobes of the pinnules become viviparous at the extremities, the seeds actually vegetating while still *in situ*, and the young plants taking root, like parasites, in the substance of the old one. From a specimen in which this peculiarity was clearly exhibited, I sketched the annexed vignette.

The figure (*a*) at page 1 represents a small frond from Ilfracombe, of the natural size: the pinnules are frequently as large as the figure to the left of the same cut.

Varieties.

There are three forms of this fern, so different as to have taken the rank of species.

The first of these is a stronger, more robust plant than the others, with a thicker stipes and larger pinnules, the stipes is also distinguished by a beautiful purple bloom: I have it in cultivation from Cornwall. It is the Adiantum Moritzianum of Klotzsch.

The second appears to me the normal form, the true Adiantum Capillus-Veneris of Linnæus. Mr. Wilson, however, whose opinion is of the highest value, appears not to consider it the ordinary plant. He first invited attention to it in the 'Phytologist' for March, 1851, in the following terms: —

"I send full-grown fronds of an Adiantum from roots which have been in cultivation upwards of ten years, and which were gathered in the Isle of Man, by my friend Mr. T. G. Rylands. It differs very considerably in appearance from the ordinary form of A. Capillus-Veneris, and may perhaps be a different species. If compared with the figure in 'English Botany,' it will be seen that the frond is narrow and oblong, by no means flabelliform, and the branches, instead of being set at an acute angle, are widely spreading. The pinnules do not taper gra-

dually into the foot-stalk, and seem to be of quite a different shape from those of the Arran specimen. The characters presented by the fronds sent, are constant in the plants under cultivation. I may here mention, that when I received the roots they were hastily planted in a common garden-pot, and were afterwards much neglected, until I thought they had quite perished for want of water. If they had not been more than usually tenacious of life such would have been their fate; but by careful nursing they were saved, and have ever since grown vigorously in a greenhouse, without artificial temperature during the winter. At the time when the roots were first gathered, the fronds were very small and imperfect."—Phytol. iv. 71.

I have represented the most characteristic of the fronds accompanying the foregoing communication at fig. *d*, page 8; it will at once be seen how closely it resembles fig. *a* at page 1. This form occurs almost invariably in the Isle of Man, on both sides of the Bristol Channel, and about the Land's End.

The third form, represented at fig. *e*, is more lax; the stalks of the pinnules are set on at an acute angle, and the pinnules themselves are more deeply divided. It is the Adiantum dissectum of some authors, and is treated as a variety of A. tenerum by Martens and Galeotti (Fil. Mex. 71), and as a variety of A. Capillus-Veneris by Sir W. J. Hooker, (Sp. Filicum, ii. 36, tab. lxxiv. B). It is certainly a less frequent plant in the British Islands than the preceding, occurring only on the Atlantic coast of Ireland, and on the southern coast of Devonshire; the specimen figured having been obligingly sent me by Mr. Flower from Mewstone Bay. It must, however, be observed, that the British forms, so different in extremes, become nearly united by others of an intermediate character occasionally found in all the localities.

Culture.

The Maidenhair is a beautiful fern in cultivation. It grows freely in a greenhouse, without any artificial heat beyond that which the protection of the glass supplies: it should never be exposed to the rays of the sun. The soil should be a mixture of loam, leaf-mould, and silver sand, mixed with small pieces

of sand-stone or free-stone: it may be planted in a common flower-pot or a cocoa-nut husk: if in a flower-pot, the lower

part of the pot should be filled with a mixture of broken pot and small lumps of charcoal, and should stand in a feeder well supplied with water; if in a cocoa-nut husk, it may either be suspended by a wire, or nailed against a wall.

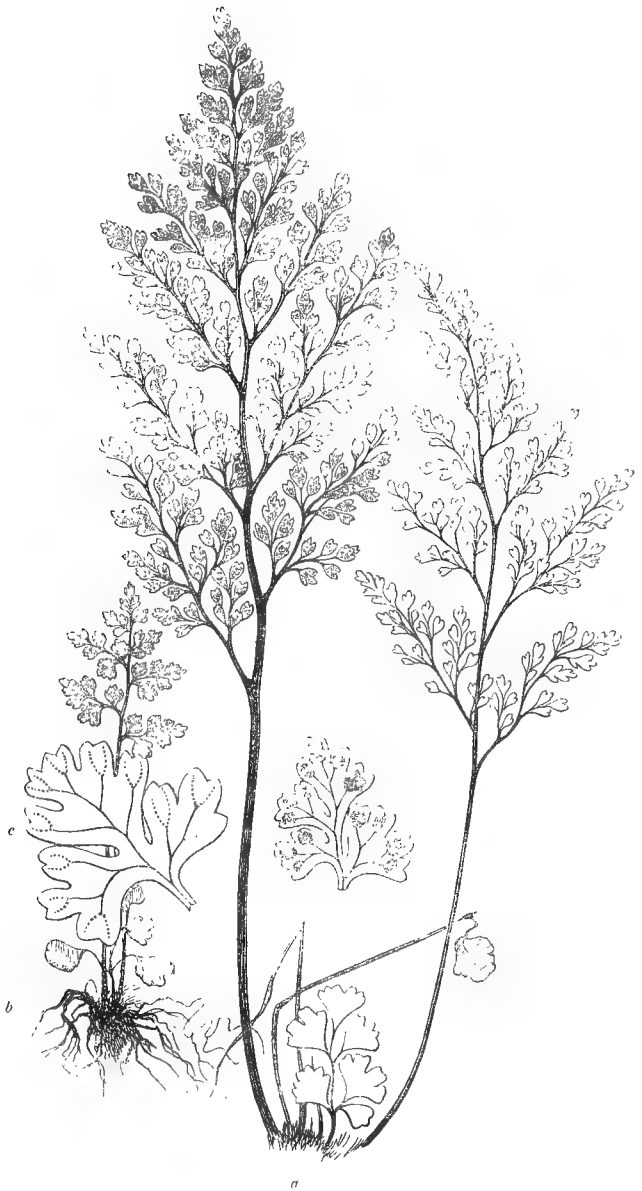
Economical Uses.

Sir J. E. Smith has the following remark upon the uses of a species of Adiantum: — "One species of this genus, *A. pedatum*, is principally used in the south of France to make a syrup, which, being perfumed with orange-flowers, is called capillaire, and known by that name throughout Europe as a refreshing beverage when diluted with water."—Eng. Flor. iv. 308. The species alluded to must be Capillus-Veneris, and not pedatum, the latter being exclusively North American. We are told by Bulliard, in his work on the medicinal plants of France (under tab. 247), that it is known in the shops by the name of "Capillaire de Montpellier," but no mention is made of its use as an ingredient of the syrup called capillaire, though the author adds that it is frequently used in medicine. However, the statement of Sir J. E. Smith, to which I have alluded above, occurs in the 'Flore Française' (ii. 549), where it is said to be commonly known under the names of "capillaire, capillaire de Montpellier, cheveux de Venus;" and that with it the syrup of capillaire is prepared. Dr. Ball, of Dublin, informs me that the inhabitants of Arran use a decoction of the leaves instead of tea.

The medicinal properties of the true Maidenhair have been much extolled. Ray, in his 'History of Plants' (i. 147), gives a very detailed account of its wonderful virtues, and gives it too with all the gravity of implicit faith. His catalogue of diseases curable by preparations of this fern, seems to include nearly all "the ills that flesh is heir to:" for his information on this head, our illustrious countryman acknowledges his obligations to one Dr. Peter Formius, a Frenchman, who really appears to have considered the plant a universal *panacea*. Still older writers also bear testimony to its powers; and Tragus, after enumerating sundry of its virtues, boasts of prudently omitting some of the uses to which it has been applied, as unworthy of Christian men: (Hieron, 533). It must, however, be borne in mind, that there is a great want of precision in the distinction of species in most of the earlier works, and that other species, more particularly Asplenium Trichomanes and A. Ruta-muraria, were confounded with the present under the common name of *Adiantum*, or, in England, of *Maidenhair*; neither should it

be forgotten that the boasted virtues of herbs and simples have, for the most part, proved fictitious, and many of those, once most famous, have fallen into utter disuse. Dr. Lindsay states (Phytol. iv. 1064) that "it is slightly astringent, and was recommended in pulmonary complaints. Like most ferns, it contains tannic and gallic acids."

The anonymous author of the 'British Herbal,' a rare work for the loan of which I am indebted to Mr. Pamplin, after recapitulating its ascribed properties, says, "It would be endless to enumerate all the virtues of this plant, of which whole treatises have been written: perhaps the reader may think those already mentioned more than fall to the share of any one vegetable: however, as it contains a very fine Nitrous Salt, of all others the most universally useful in Medicine, it may probably be serviceable in most of the above-mentioned cases, without any great exaggeration of its virtues, and because the native salts of plants are best got out of them by boiling, the form of a decoction seems to be the most proper to take it in."



ANNUAL MAIDENHAIR, (*natural size*).

Characters.

Genus. — Gymnogramma. Ultimate divisions of frond contracted at the base but not stipitate, without a midvein: veins dichotomously branched, branches free at the extremity: involucre not apparent: clusters of capsules linear, on both branches of the vein, and therefore forked, finally confluent, and occupying almost the entire under surface.

Species. — Leptophylla. Stipes brown, about the same length as the frond: frond ovate-deltoid, pinnate: pinnæ stipitate, pinnate: pinnules stipitate, pinnate: lobes twice dichotomously divided.

Synonymes, Figures, &c.

Polypodium leptophyllum, *Linn. Sp. Pl.* 1553; *Swartz, in Schrad. Journ.* ii. 27.

Grammitis leptophylla, *Swartz, Syn. Fil.* 23 *et* 218; *Woods, Tourist's Flora*, 424.

Gymnogramma leptophylla, *Desvaux, Berl. Mag.* v. 305; *Newm. Phytol.* iv. 914; *Moore*, 62.

Acrostichum leptophyllum, *Flor. Franç.* ii. 565.

The figure of this fern in Schkuhr (t. 26) is admirable, and leaves nothing to be desired: that in Swartz (Syn. Fil. t. 1, fig. 6) is good, but represents a weak plant. With regard to the generic name, I adopt it to avoid confusion; but in doing so, must express my disapprobation of the association of such a heterogeneous group of species as Presl and other authors have placed under this genus. Neither do I see why the present species has been separated from Grammitis of Swartz, whose characters of the genus scarcely differ from those subsequently given by Desvaux for the genus Gymnogramma, as under: — "Capsulæ venis simplicibus furcatisve frondis insertæ. Indusium nullum. Frondes pinnatæ, bipinnatæ decompositæque. Radices cæspitosæ."—(Berl. Mag. v. 304). The typical species, L. rufa, has little relationship with that now under consideration, which stands the seventh in Desvaux's list. The name, however, of Gymnogramma leptophylla, has become familiar to

European botanists, and also to botanists in this country, since I introduced it into the 'Phytologist:' I should otherwise propose to establish a new genus for this and some allied species, under the name of Dicranodium ; believing that the form now under consideration cannot be naturally associated with the species which Swartz and Desvaux have severally selected as the types of their genera.

This species has no mention in the works of Withering, Smith, Sowerby, Francis, Hooker and Arnott or Babington.

Geographical Range.

This fern occurs in various and distant but mostly maritime European localities. Sadler gives Germany, France, Italy and Spain, as its European countries ; Link gives Naples, Sicily, and the Morea ; Woods enumerates Brittany, Provence, and Italy ; Schkuhr, Weber and Mohr, and Bory de St. Vincent give Switzerland. I am indebted to my late lamented friend, Col. Bory de St. Vincent, for the beautiful specimen figured in illustration of the species at page 11, (fig. *a*) ; it was collected by himself on the Alps : and my friend Mr. Allcard, or some of his travelling companions, met with it in several localities both on the Swiss and French Alps : nevertheless, Godet omits it from his 'Flore du Jura.' In Mr. Ward's rich herbarium are examples from Geusans, from Castel Gondolfo, Lake of Albano, from Virgil's tomb, near the grotto of Posilippo, and from Naples, near the Hermitage, all collected by Mr. E. W. Cooke. I have seen many specimens from the Canaries and Azores. Bory de St. Vincent found it in Algeria ; and Schimper distributed it with his Abyssinian plants, bearing this printed label : — "Ad ripas elatas, locis humidis et umbrosis prope Adoam. d. 19 Sept. 1837." In the New World, it is recorded by Kunze as having been found in Mexico.

It has long been spoken of as a British fern, and its occurrence in the British dominions is now established beyond a doubt : but its only ascertained locality is the Island of Jersey, and it is merely in compliance with the universal custom of English botanists, that I include the Channel Islands in a history of British Ferns ; for nothing can be more obvious than

that the connexion of the Channel Islands with Britain is political only, and that geographically and botanically they belong to France.

(Scotland.—"When I was in Madeira, a lady of the name of Veitch, whom we knew there, showed me a small dried specimen of a fern which she had gathered in Scotland, I think in Aberdeenshire, and which was to all appearance precisely the same as the Gymnogramma leptophylla of Madeira."—Mr. William Tanner, Phytol. February 1852, (wrapper). "Seeing in the February 'Phytologist' the 'supposed discovery of Gymnogramma leptophylla in Scotland,' I wrote to the discoverer (Miss Veitch) in Madeira, to ascertain the exact locality of the plant in Aberdeenshire. That lady very kindly and promptly sent me the communication, of which the following is a copy:—'I have much pleasure in informing you that the specimen of Gymnogramma leptophylla in my possession, I discovered in a stone dyke on the high road, on the right hand side, leading from Braemar (Aberdeenshire) to Ballater, nearly opposite Invercauld House, and, as far as I remember, where the Highlanders perform their annual feats at the gathering, *viz.*, a rock called the Lion's Face, at the foot of which, inclosing trees, is the above-named dyke.'"—Rev. W. W. Spicer, in Phytol. iv. 600. "I am not acquainted with Gymnogramma leptophylla; but if it resemble any of the forms of Polypodium alpestre, I should give the lady who thought she found the former at Braemar credit for having gathered it in the corrie of Loch-na-gar, or some such place, and confounded it with small Athyrium Filix-fœmina, which grows in the place she has pointed out, along with Cystopteris fragilis and a few other commoner ferns. Careful investigation of her locality for it did not, however, turn up a single specimen of Gymnogramma."—Mr. Backhouse, in Phytol. iv. 716. The specimen in question has been most obligingly placed in my hands, and is certainly the plant which I understand as Gymnogramma leptophylla. Of the veracity of the finder no question can be raised; but the accidental transposition of labels is so frequent, that the possibility of such an occurrence, and the absence of further evidence, must be my excuse for inclosing the record in parentheses).

Jersey.—In the winter of 1852-3, I learned from my friend, Mr. Henry Hagen, that a lady had discovered Gymnogramma leptophylla in one of the Channel Islands; but knowing how numerous were the mistakes in naming ferns, and believing that the specimens had not been examined by a practised botanist, I reserved the intelligence until my friend kindly procured me a specimen (fig. *b*), and finding there was no error in name, I announced the fact in the 'Phytologist' for March, 1853. (See Phytol. iv. 914).

During May, 1853, I received a number of communications on this subject, which were thus summed up in the 'Phytologist': — "Numerous

communications from Jersey represent Gymnogramma leptophylla as widely distributed in that Island, growing on the banks of exposed lanes having a southern aspect, more especially in those localities in which the moistened soil induces the growth of Marchantia, in the company of which plant it appears particularly to flourish.; it also occurs, but not so frequently, growing in moss. The principal localities are near St. Haule, near St. Aubin's, and in several places near St. Laurence. In one spot near the last named place, it grows plentifully for a considerable distance along a hedge-bank, extending as far as the bank is exposed, but ceasing exactly where the lane is shaded by trees."—Phytol. iv. 974.

Mr. Ward writes :—" I was kindly taken by M. Piquet, of St. Helier's, to the great object of attraction, — Gymnogramma leptophylla. I saw it growing, as stated in the 'Phytologist,' on a bank with a South-western aspect, not densely shaded by trees, as is the case in most of the Jersey lanes, but protected from the direct rays of the sun by the dwarf vegetation of the bank, which, from the constant oozing of a small stream, is sufficiently damp for the growth of Marchantia, with here and there a patch of Fissidens bryoides. I was shown two stations for this interesting plant by M. Piquet, and a third, about a mile from the former, by the Rev. W. Wait. It doubtless will be found in other localities, as the climate must nearly approach that of the South of France and of Italy, where the Gymnogramma abounds."—Mr. Ward, in Phytol. iv. 1090. " At St. Laurence and near St. Haule."—M. Piquet, in Phytol. iv. 1094.

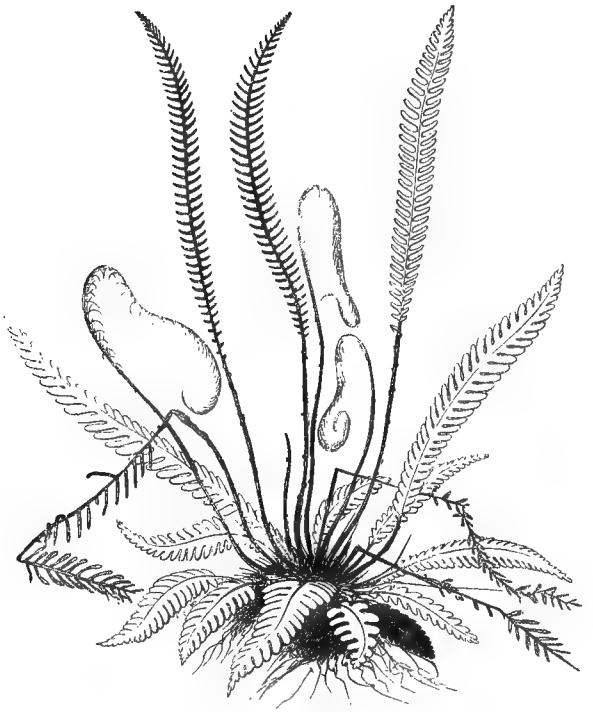
Description.

The radicles are brown, fibrous, and clothed with fibrillæ : the caudex is a small, tufted corm, slightly hairy at the crown, never extending itself laterally or increasing by offsets ; it generally bears two, sometimes three, and rarely four, rigid, erect fronds, usually about three inches high : the stipes is somewhat shorter than the leafy portion of the frond, rather stout and glabrous, and of a pale brown colour : the outline of the frond is somewhat ovate, but usually acutely pointed, pinnate : pinnæ alternate, distinctly stipitate, pinnate, their outline somewhat ovate : pinnules alternate, stipitate, pinnate : lobes again divided, and the ultimate divisions bifid or trifid, a free vein running into each : these veins are curved, and are generally capsuliferous from the fork to near their extremity, the capsules are thus ranged in series, which at first are manifestly linear, but subse-

quently become amorphous, the crowded capsules eventually covering all the back of the frond. It must also be obvious, that the capsules being crowded along the vein, even to its point of furcation, the mass itself becomes furcate. Fig. *c* represents a portion of frond from which the capsules have been removed. Besides these fertile fronds, there are other shorter, more fragile, more membranous, and infinitely less divided fronds, with three or four large, flabellate pinnæ, which are either barren, or sparingly seeded. It is strictly an annual fern; and when the species is raised from seed, the plant appears to consist, for some weeks, of a single, undivided, flabellate frond.

Culture.

The soil used for this fern should be a light friable loam, mixed with abundance of fine clean sand: it requires almost constant moisture, and should be covered by a bell glass; the Marchantiæ and mosses should be allowed to grow freely in its company. Some soil from its native locality in Jersey, kindly given me by Mr. Ward, has proved very productive; it appears to have been filled with the seeds. This fern has long been cultivated in our greenhouses, and when once established is difficult to eradicate. Having observed that this is strictly an annual fern, it is scarcely necessary to state that the usual care bestowed on the preservation and division of the corm will in all probability be unavailing.



HARD FERN, (*one-fifth the natural size*).

Characters.

Genus.—Blechnum. Midvein distinct, lateral veins anastomosing in a linear series on each side, parallel to the midvein, and emitting free branches to the margin: involucre linear, opening towards the midvein: capsules in a linear series on the inner side of each anastomosing vein.

Species. — Spicant. Fronds of two kinds: fertile fronds erect, linear, pinnate: pinnæ distant, reflexed, narrow, linear: the lower portion of the stipes naked: barren fronds prostrate, lanceolate, pinnatifid: pinnæ close, flat, broad, blunt.

Synonymes, Figures, &c.

Osmunda spicant, *Linn. Sp. Pl.* 1522; *Lightf. Fl. Scot.* 654; *Huds. Fl. Ang.* 450; *Bolt. Fil. Brit.* 8, t. 6.

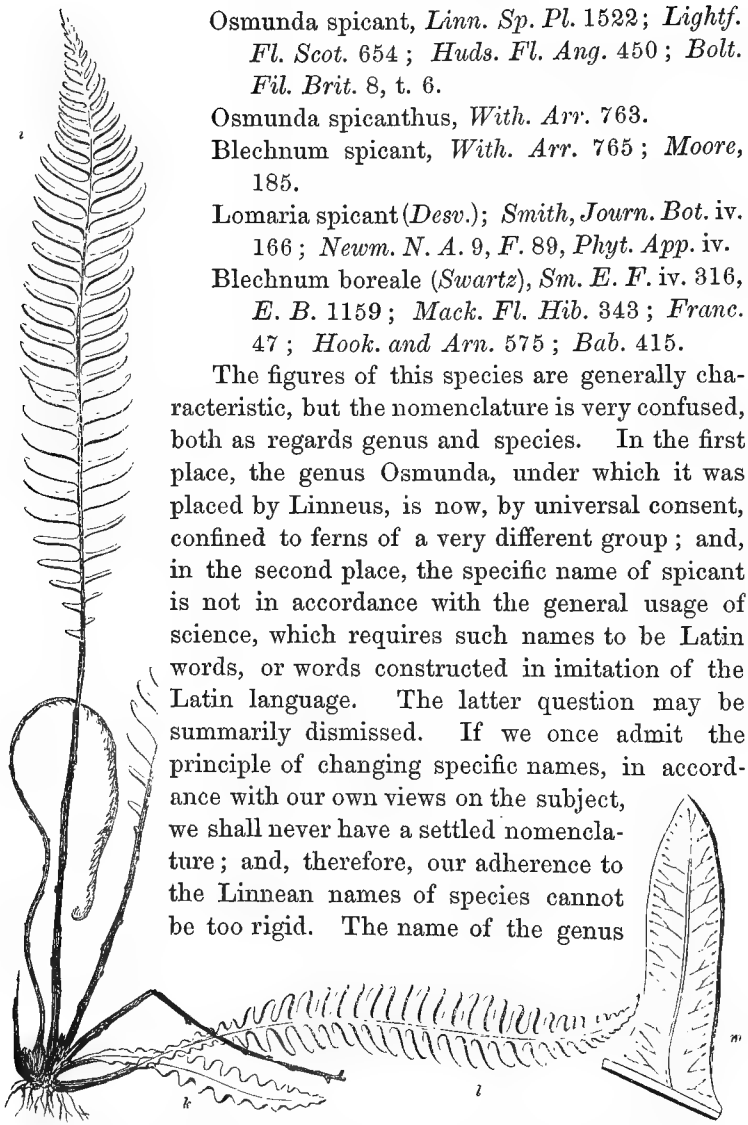
Osmunda spicanthus, *With. Arr.* 763.

Blechnum spicant, *With. Arr.* 765; *Moore*, 185.

Lomaria spicant (*Desv.*); *Smith, Journ. Bot.* iv. 166; *Newm. N. A.* 9, *F.* 89, *Phyt. App.* iv.

Blechnum boreale (*Swartz*), *Sm. E. F.* iv. 316, *E. B.* 1159; *Mack. Fl. Hib.* 343; *Franc.* 47; *Hook. and Arn.* 575; *Bab.* 415.

The figures of this species are generally characteristic, but the nomenclature is very confused, both as regards genus and species. In the first place, the genus Osmunda, under which it was placed by Linneus, is now, by universal consent, confined to ferns of a very different group; and, in the second place, the specific name of spicant is not in accordance with the general usage of science, which requires such names to be Latin words, or words constructed in imitation of the Latin language. The latter question may be summarily dismissed. If we once admit the principle of changing specific names, in accordance with our own views on the subject, we shall never have a settled nomenclature; and, therefore, our adherence to the Linnean names of species cannot be too rigid. The name of the genus



i. Fertile frond. *k*, *l*. Barren fronds. *m*. Pinnule of barren frond, showing the venation.

is a much more difficult matter to settle. I believe that Withering was the first author who ventured to transfer this species from the Linnean genus Osmunda to the Linnean genus Blechnum, an alteration made, according to its author, "in compliance with the opinion of Dr. Smith and Mr. Robson." The name thus became Blechnum spicant; and, ten years subsequently, the change was adopted by Swartz (Syn. Fil. (1806), p. 115), as regards the genus, and the specific name altered from spicant to boreale. Willdenow, in his 'Species Plantarum,' instituted the genus Lomaria, but retained the present species under the genus Blechnum; while Desvaux, Presl, Sadler, and other authors of good repute, referred to Willdenow's new genus the species now under consideration, and restored the Linnean name to the species, calling the plant Lomaria spicant. Immediately after the publication of my first edition, the same name was published by Mr. J. Smith in the 'Journal of Botany' (iv. 166); and it was subsequently adopted (1841) by the compilers of the Edinburgh 'Catalogue of British Plants:' but a careful examination of the characters of the two genera, as defined by their respective authors, induces me to conclude that they are absolutely identical, and I therefore revert to the Linnean name, in accordance with the views of Withering, Roth (Fl. Germ. iii. 44), Koch (Syn. ed. 2. p. 984), Fries (Sum. Veg. Scand. p. 83), DeCandolle (Flore Fr. ii. 551), and Ledebour (Fl. Ross. p. 521).

Geographical Range.

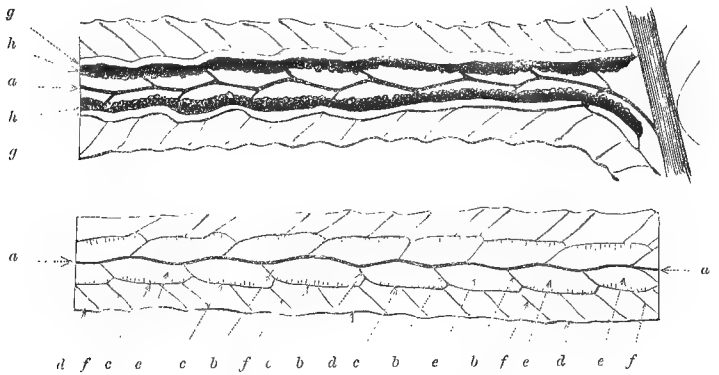
The Hard Fern occurs in every European list, and has been found in Northern Africa: it has also been recorded as a native of North America, but I have met with no satisfactory evidence on this subject; and it is absent from collections which have been most obligingly sent me, from different localities, by Mr. Boott, Mr. Lea, and Mr. Oakes. It is almost universally distributed throughout Great Britain, in woods, on commons, heaths, and all uncultivated ground: it is fond of moisture, and prefers clayey and gravelly soil: on chalk it is rarely met with. I do not recollect having seen a specimen from the chalk hills of Kent, Sussex, or Surrey.

Description.

The radicles of this fern are black, tough and wiry; the caudex is tufted and hairy. The young fronds make their appearance in May: they are of two kinds, fertile and barren; the fertile fronds arrive at perfection in September, shed their seed, and disappear before winter, but the barren fronds continue perfectly green and vigorous throughout the year. The fertile frond) represented of half the natural size in the figure at page 18) is erect, linear, simply pinnatifid, and pointed at the apex; the lower half of the stem is dark purple, smooth, shining, and naked, but furnished on each side with some minute rudimentary pinnæ, scarcely observable without a close inspection, and having towards the base a few scattered, long, narrow, and pointed scales: the upper half of the stem has linear, narrow pinnæ, rounded at the apex, convolute at the sides, and densely and completely covered with seed on the inferior surface.

I have to acknowledge the obligations I am under to Miss Beever, of Coniston, for fine Westmoreland specimens of this plant, sparingly fruited, and to Mr. Jenner, of Lewes, for similar Sussex specimens. From these I have been able to learn more of the venation of this species than appeared possible from an examination of the usual densely fruited form. In these specimens the pinnules remain flat, as in the barren fronds, a circumstance which much facilitates the inquiry. The midvein of the pinna (*a a a*, page 21) is somewhat sinuous, giving off oblique, alternate, lateral veins (*b b b*); these lateral veins are united to each other by what may be termed an irregular longitudinal vein (*c c c*), running parallel with the midvein, and nearly equidistant between this and the margin of the pinna (*d d d*); the union of the lateral veins causes the formation of a series of what may be termed closed cells (*e e e*): on each side of the midvein, from the two longitudinal veins, arise other lateral and slightly capitate veins (*f f f*), which proceed obliquely towards the margin and terminate just before reaching it; to the two longitudinal veins are attached the capsules, in a continuous series, on that side of each vein which faces the midvein; the points of their attachment are indicated in the lower figure, throughout the course of the two longitudinal

veins: the capsules are covered by a continuous, linear, white, membranous involucre, which opens towards the midvein; these involucres are represented in the upper figure by the white line (*g g*), and the series of capsules appearing beneath them, are represented by the black line (*h h*). The fronds from which the descriptions and drawings were made, are so different from the usual state of fertile fronds, that the characters are chiefly valuable as affording a key to the normal venation, which has hitherto almost eluded our inquiries: yet, furnished with this key, we find that the same structure obtains, in a minor degree, in all the fertile fronds.



The barren fronds are much shorter than the fertile, generally horizontal, strap-shaped, and pinnatifid, and have a short portion of the stipes, not more than a sixth, naked and slightly scaly.

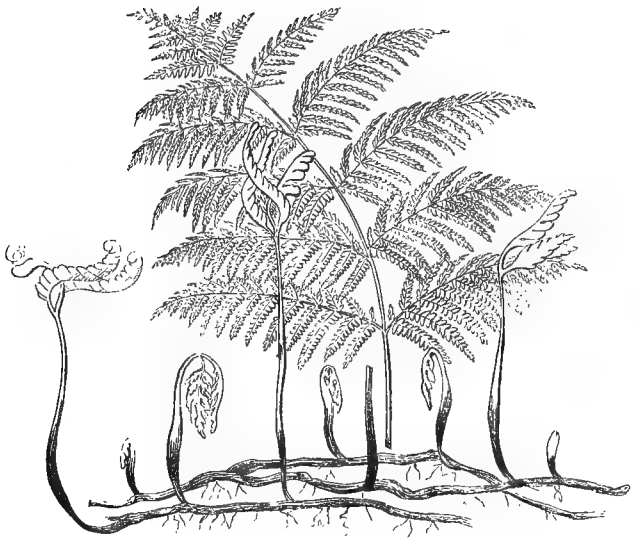
Varieties.

This fern is very subject to those deviations from normal form which are so highly prized by many of our most experienced and most successful cultivators. Some of these deviations in Blechnum spicant consist in a bifid or trifid termination to the frond, others in the atrophied state of all the pinnæ, the stipes and rachis alone remaining; the former being fringed with amorphous fragments of the lost pinnæ. I have to

acknowledge my obligation to Mr. Wollaston of Chiselhurst, Mr. Gray of Hammersmith, Dr. Allchin of Bayswater, and Mr. J. R. Kinahan of Dublin, for much valuable information on this subject. The last-named gentleman has very completely and ingeniously systematized these deviations, in a paper published in No. 147 of the 'Phytologist,' and intituled "On the Classification and Nomenclature of Ferns," (see Phytol. iv. 1033). The author of this paper proposes that in future "all descriptions of forms of ferns be divided under the following four heads: — 1. Form, or original type. 2. Subform, or forms aberrant from some geographical influence, such as climate, &c., and including what may be called doubtful species. 3. Subvarieties, or non-permanent monstrosities. 4. Varieties, or permanent monstrosities." After maturely considering this system, which the author explains *in extenso*, I have concluded that the deviations in question do not imperatively demand a notice in a botanical work like the present.

Culture.

The Hard Fern is well worth cultivating on rock-work; its fertile fronds are delicate and beautiful during the summer and autumn, and its barren fronds bright glossy green and persistent throughout the winter. It likes a stiff clayey soil, and is almost the only species that succeeds in such a soil; in loam, or a mixture of loam and peat, it also succeeds well, but requires more constant watering. When potted, it should have abundance of air, not liking the confinement of a glass shade, neither does it fruit so freely when covered as when exposed. On rock-work it should be so planted as to face the North, as, in a state of nature, it shows a very decided preference for the North side of hills.



COMMON BRAKES, (*one-tenth the natural size*).

Characters.

Genus.—EUPTERIS. Midvein distinct, lateral veins anastomosing at the margin, forming a marginal vein : involucre attached to the inner side of the marginal vein, linear, its margin split into capillary segments : capsules attached in a linear series to the marginal vein, exterior to the involucre : epidermis prolonged, bleached, reflexed, split into capillary segments and covering the capsules in the manner of an involucre.

Species.—AQUILINA. Caudex a creeping rhizome : stipes long, erect : frond deltoid, very compound.

Synonymes, Figures, &c.

Pteris aquilina, *Linn. Sp. Pl.* 1533 ; *Lightf. Fl. Scot.* 657 ; *Huds. Fl. Ang.* 451 ; *Bolt. Fil. Brit.* 16, t. 10; *With. Arr.* 765 ; *Sm. E. F.* iv. 318, *E. B.* 1679 ; *Mack. Fl. Hib.* 343;

Franc. 55; *Newm. N. A.* 11, *F.* 93; *Hook. and Arn.* 575; *Bab*, 415; *Moore*, 189.

Allosorus aquilinus, *Presl. Tent.* 143.

Eupteris aquilina, *Newm. Phytol.* ii. 278; *Phytol. App.* iii.

It will be seen by the list of synonymes, that authors are generally agreed in giving to this common fern the name of Pteris aquilina; but neither its mode of growth, vernation, or fructification agree with those of the species which Linneus has placed as typical in his genus Pteris. Robert Brown was the first to perceive how essentially the fructification of the common brakes differed from that of other ferns with which it was associated under the name of Pteris. Sir J. E. Smith dwelt on this discrepancy, but appears not to have considered it generic; and it seems to have escaped the notice of almost every other botanist. John Smith—a name I am ever ready to honour—gives the weight of his authority against separating aquilina from the genuine Pterides: he remarks, in the 'Journal of Botany' (vol. iv. p. 165), "Some observers have stated that the sori of Pteris aquilina are furnished with a narrow indusium situated on the inner side of the receptacle, but from my own observation I cannot consider the slightly elevated fimbriate ridge which bounds the inner side of the sporangia as being analogous to an indusium." In my attempt, therefore, to separate generically Pteris aquilina from the genuine Pterides, I fear I shall meet with slender encouragement. It should, however, be observed, that the genus Pteris has long been disintegrated: several marked forms having been separated under the names of Allosorus, Platyloma, Doryopteris, Litobrochia, and Cassebeera: while a group, more strikingly heterogeneous since the abstraction of these divisions, still retains the original appellation of Pteris. In accordance with established usage, the name of Pteris should remain with the first or typical species, and such others as may be supposed to possess the greatest number of distinctive characters in common with that typical species: while aquilina, the thirteenth on the Linnean list, and perhaps more decidedly remote than either of the others, seems to require a new name. I therefore propose calling it Eupteris aquilina, since, although it is not the Linnean type, it is essentially *the* Pteris of all botanists.

Presl, in his 'Tentamen Pteridographiæ' (p. 143), has revised and divided the genus Pteris, referring the present species to Bernhardi's genus Allosorus: but in this genus he has included species which scarcely possess a character in common: and, moreover, the *Allosori aquilini*, to which division of the genus the brakes is referred, constitute the third and not the typical division of the genus, which properly includes the Allosorus crispus, a very distinct and different plant. It therefore appeared necessary to institute a new genus for the reception of the Allosori aquilini of Presl.

The brakes is the "Filix femina" of all the older authors, and the transfer of that trivial name to another species was made by Linneus, who gave the plant now under consideration its present appellation of aquilina. However unadvisable the change may have been at the time, it has been generally adopted by subsequent botanists.

Figures invariably fail to give a correct idea of this fern, from the difficulty of reducing it to the requisite size.

Geographical Range.

The geographical range of this fern can scarcely be ascertained, until we are agreed upon the latitude to be allowed for variation in a species. Mr. Houlston, of Kew, one of our best pteridologists, associates under the name of aquilina cognate forms from all parts of the world. Every country of Europe furnishes the normal form, as Pteris aquilina; then we have three Russian species, P. nudicaulis, P. brevipes and P. taurica; Africa has its P. lanuginosa and P. capensis; Nepaul its P. recurvata; central India its P. latiuscula; Ceylon its P. lanuginosa; New Zealand its P. esculenta; the Sandwich Islands P. decomposita; North America its P. caudata; South America P. arachnoidea; the West Indies a form allied to P. caudata; the Cape de Verde Islands, the Azores, the Canaries, and Madeira, different forms, all known by the name of P. aquilina. Although the whole of these may be referred, without doubt, to the genus Eupteris, I am not willing to unite them into one species, on account of the extreme discrepancy in the circumscription, detail, and general appearance of the frond.

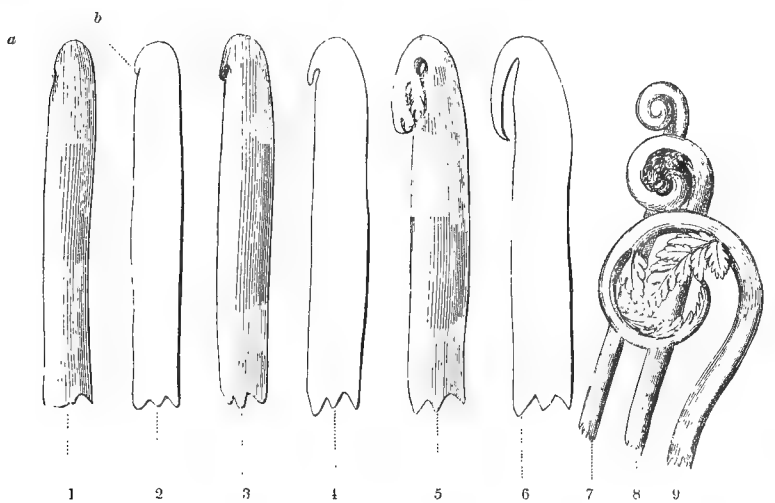
This is the most abundant of our British ferns; there being scarcely a heath, common, wood, or forest, in any part of the United Kingdom, in which it does not make its appearance. Its presence in great abundance is said to indicate poverty in the soil; but from its luxuriance when growing in the vegetable mould of woods, and in highly manured gardens, I am inclined to suppose that its usual absence from rich cultivated land, is rather to be attributed to the effects of the plough and the hoe than to any quality of the soil. It is quickly eradicated by either of these instruments, and seems peculiarly susceptible of injury. It appears one of those truly wild plants which fly from man, and take refuge in wastes and wildernesses. In size it is extremely variable; being sometimes scarcely a foot in height, while at others it reaches an altitude of ten and even twelve feet. Although it occurs on every other description of soil, it avoids chalk, and scarcely a plant can be detected on the South Downs of Sussex. In dry gravel it is usually present, but of small size; while in thick shady woods, having a moist and rich soil, it attains an enormous size, and may often be seen climbing up, as it were, among the lower branches and underwood, resting its delicate pinnules on the little twigs, and hanging gracefully over them: under these circumstances it is a fern of exquisite beauty.

Description.

The radicles are brown, fibrous, and tomentose: the caudex is a nearly cylindrical, brown, velvety rhizome, about the size of a goose-quill; it is always subterranean, extending itself rapidly in a horizontal direction, it sometimes however descends deeply and almost perpendicularly, When the London and Croydon Railway was in progress, I found, in the New-Cross cutting, great abundance of these rhizomes in a decayed state, some of them extending to a perpendicular depth of fifteen feet. Whenever the fern has stood unmolested for a long series of years, the soil becomes filled with matted masses of these rhizomes, every portion of which sends up fronds in the spring, so that acres of land are sometimes covered with a growth of bracken, a circumstance which has induced Dr. Johnston, in his

very interesting 'Terra Lindisfarnensis,' to describe this species as "gregarious." The young fronds make their appearance in May: they are extremely susceptible of cold, and it is by no means unusual to see the earlier fronds, before their expansion, entirely destroyed by the late frosts in spring: I have observed them cut down as late as the 20th of May.

The fronds rise perpendicularly from the rhizome at unequal intervals: until they nearly reach the surface of the ground the stipes only is discernable, the apex being rounded and displaying no trace whatever of a foliaceous portion, (fig. 1): a slight and scarcely perceptible indentation does, however, exist at the point *a* in that figure; and the slight projection above this, better shown at *b*, in the sectional view (fig. 2), contains the future foliaceous portion. Figures 3 and 5 represent the same frond in a state somewhat more advanced, and figs 4 and 6 are median longitudinal sectional views of the same. In all these it will be seen that the foliaceous part is bent forward on



the stipes, forming therewith a kind of hook; a structure strikingly different from that of Pteris tremula, represented at figs. 7, 8, 9, which, although generally held to be closely allied to aquilina, very clearly exhibits the usual circinate vernation. It may, however, be observed, that the extreme point of the bent rachis has a slight tendency to exhibit a curve, as shown in

fig. 6; and all the partial rachides are more or less circinate, as shown in the figure at page 23.

There is something very anomalous in the rapid development of the foliaceous portion of the frond. At a stage, as regards the stipes, when the circinate frond of Pteris tremula exhibits, if unrolled, all its pinnæ and pinnules, and even the incipient fructification, that of the present species is a mere indication, a slight inequality on the surface, and its component parts cannot be detected under a lens of high power; yet, in a few days, we find it has increased and unfolded with such marvellous rapidity, that in aquilina we have a frond surpassing in magnitude that of nearly every other British fern.

The form of the frond is nearly triangular, the base being somewhat, but not materially, the shortest of the three sides. The stipes is rather more than half the length of the frond; it is green, and rather pilose: the pinnæ are pinnate; the pinnules pinnatifid; the lobes are generally rounded and entire, but sometimes again divided: the first superior pinnule on each pinna is usually very small, and, as it were, rudimentary only.

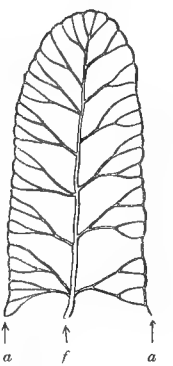
The fronds are almost invariably fertile, but all parts of the same frond are not equally so. In seedling plants, or those which occasionally grow in caves, fissures, or on stone walls, the fronds are smaller, tender, delicate and barren; the margins of the lobes of the pinnules are then flattened, and broadly notched.

Mr. Lees sent me an example of this form, gathered on a wall near Worcester Cathedral; Mr. Westcombe another, found on a wall in the centre of the city of Worcester: it occurs commonly on the garden-walls at Deptford, and in one instance it has established itself on the brick wall of a house in that town. Mr. Woodward's collection contains a fine example, gathered by Mr. Pamplin at East Grinstead; and Mr. Ewing has, for many years, observed a solitary plant growing on the wall of the bridge of the castle-moat, at Norwich, the fronds varying from three to nine inches in length. In these and other instances, too numerous to mention, the same characters are always preserved.

The portion of the stipes below the ground is of a dark brown colour, velvety, and considerably stouter than the portion above ground; and it closely resembles the rhizome in its

general appearance. When this incrassated portion of the stipes is cut through, either in a direct or oblique direction, the section bears a regular figure, as represented in the annexed cut, the left-hand section being direct, the right-hand one oblique. This figure is by many said to represent an oak tree, and is called King Charles in the oak; by others it is supposed to resemble a spread eagle, hence the specific name of "aquilina" given by Linneus. From Mr. Francis's 'Analysis of Britsh Ferns' (p. 55), we learn that this appearance "was a matter of notoriety at a very early period. Thus we find," says that author, "in a most rare little book, entitled 'A Dyaloge or Communycation of two persons devysed or set forth, in the Latin Tonge, by the noble and famous clarke Desiderius Erasmus, intituled, The Pilgrimage of pure Devotion newly translatyd into Englyshe' (no date, supposed to be 1551), is the following curious passage: — 'Peraventure they ymagyne the symylytude of a tode to be there; evyn as we suppose when we cutte the fearne stalke there to be an egle.'" Dr. Johnston, in his 'Terra Lindisfarnensis,' says the mark is also compared to the "impression of the deil's foot;" an impression, by the way, with which I am not so familiar as to be able to decide on the aptness of the comparison.

The frond is killed by the first frosts of autumn, however slight they may be: it instantly turns to a deep brown colour, but remains perfectly undecayed, and frequently in an erect position, during the whole winter.

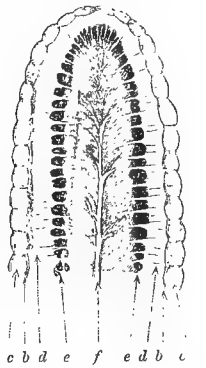


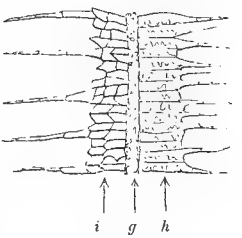
When fertile, the lobes are incurved or convolute at their edges, and their elasticity is so invincible, that it is very difficult to maintain the lobe in a flat position, adapted for an examination of its fructification. The lateral veins, which are placed either opposite or alternately, are twice dichotomously divided before reaching the margin, where they are united together by means of a marginal vein. The accompanying diagram shows the formula of venation in a lobe which has been flattened for the purpose of exhibiting it more clearly. Attached to the marginal vein, *a a*, and extending throughout its length,

is a bleached semihyaline membrane, fringed with a series of jointed capillary segments. Beneath this membrane are the capsules, also attached to the marginal vein, and arranged along it in a continuous linear series, but more abundantly at its points of union with the transverse veins. Again, beneath this linear series of capsules, is a second bleached and fringed membrane, very similar to the first. It becomes an interesting question, whether both these membranes can be considered analogous to the usual involucre, or one of them only; and if one only, then which are we to select? Roth (Flor. Germ. iii. 42) does not appear to have observed the inferior membrane, but describes the superior one as an involucre originating in an elongated epidermis. Sir J. E. Smith, although aware of this inner membrane, unhesitatingly speaks of the outer one as the "cover," (Eng. Flor. iv. 304). Mr. Wilson, who has most obligingly favoured me with many valuable observations on this remarkable structure, seems to regard the inferior membrane as the involucre; the occasional presence of the superior membrane in the total absence of capsules, proving, in his opinion, that it is not necessarily connected with fructification. Still, although I may state that I do not detect its presence in seedling or barren plants, and am therefore led in a measure to associate its appearance *at least with the power of producing fruit*, yet I am quite inclined to consider it distinct from a true involucre, and more analogous to the inflexed portion of the pinnule in Adiantum and Allosorus, which I have always regarded as perfectly distinct, although considered an involucre by Sir J. E. Smith, and all our more eminent authorities; and although there can be no question that its presence is connected with fructification, since, in both these genera, it is absent when the frond or pinnule is entirely barren: instances, however, occur in all the genera above cited, in which this inflexed or folded margin of the pinnule is totally unaccompanied by the presence of capsules, as pointed out to me in Eupteris by Mr. W. Wilson. Mr. Jenner, who has most obligingly taken the greatest pains to assist me in the inquiry, as regards Eupteris, also appears to consider the exterior membrane as nothing more than a prolongation of the outer epidermis. The question, as regards the interior membrane, seems much more restricted. We are compelled to regard this as an involucre, from the

absolute absence of any other analogous part to which, with any show of plausibility, it can possibly be referred.

I have stated that the margins of each lobe are convolute, so that the marginal vein and its accompanying membranes, together with the series of intervening capsules, are bent over towards the midvein, presenting an appearance which I have attempted to represent in the accompanying figure of the under surface of the apex of a lobe: *b b* is the marginal vein in its natural position; *c c*, the inflexed or convolute portion of the leaf; *d d* the superior membrane partially covering the capsules, which are shown at *e e*, projecting from beneath it; *f* is the midvein of the lobe. The inferior membrane, although very similar to the superior, has some points of difference; each consists of a disk divided into cells, and a marginal fringe of jointed hairs or capillary segments, but the disk is somewhat differently marked. Mr. Jenner has taken great pains to obtain a view of both the membranes at once, and has favoured me with the annexed sketch, the accuracy of which I have tested by examination. The marginal vein of the lobe is supposed to be presented to view edgeways at *g*, the capsules having been removed, in order to leave the view of the membranes unobstructed; *h* represents the superior, and *i* the inferior membrane.





Varieties.

Mr. Moore has most obligingly presented me with two specimens of this fern which he considers varieties, and to which he has assigned names and definitions, as under: —

"α. *vera*; pinnules for the most part pinnatifid, or sinuate, the segments oblong obtuse.

"β. *integerrima*; pinnules almost all entire, one or two basal ones sometimes very slightly lobed."

I have no fault to find with these definitions, but would observe, that having commonly found both these, and a number of intermediate forms, on the same rhizome, I am not inclined to regard them as of sufficient importance to take rank as varieties : dissimilarity in the leaves of the same individual plant occur, not only in other ferns, but also in phænogamous plants ; they are particularly observable in the mulberry.

Culture.

Few gardeners could be induced to cultivate this fern, otherwise than in a fernery ; and there it is extremely difficult to keep it within moderate limits. In a greenhouse it is more manageable, and, coming up abundantly in peat, and every description of earth brought from commons, it has a remarkably elegant and pleasing appearance while still small : it is, however, best to eradicate the rhizomes as soon as the fronds have assumed the tints of autumn.

Economical Uses.

In an economical point of view, this is the most valuable of our British ferns. " If cut while green," says Lightfoot in his ' Flora Scotica ' (ii. 658), " and left to rot upon the ground, it is a good improver of the land : * * it is an excellent manure for potatoes, and if buried beneath their roots, it never fails to produce a good crop : * * it makes a brisk fire for the purposes of brewing and baking. * * In many of the western isles [of Scotland], the people gain a very considerable profit by the sale of the ashes to soap and glass makers." Mr. Bladon, of Pont-y-Pool, in the ' Magazine of Natural History ' (n. s. iv. 242), informs us that " in many of the open mountainous parts of Wales, where it grows abundantly, the brakes is cut down in the summer, and, after being well dried, is burned by the cottagers in large heaps, for the sake of the alkali contained in the ashes : when sufficiently burned, enough water is sprinkled on the ashes to make them adhere together, when they are rolled into round balls, about two inches or

two-and-a-half in diameter. These balls are thoroughly dried, and carried about the neighbourhood where they are made, for sale in the markets; and they are also frequently kept by shopkeepers, to supply their customers. The price of these balls varies, in different seasons, from 3*d.* to 8*d.* per dozen. They are very much prized, by some housewives, for their utility in the wash-house, in economizing the use of soap. When about to be used they are put into the fire, and when heated to a red heat, are taken out and thrown into a tub of water: the water, in the course of an hour or so, becomes a strong ley, and is then fit for use." Mr. Hardy also says, that "in some parts of Berwickshire the ashes were once formed into a kind of potash, and, with an admixture of tallow, into a home-made soap," (see Terra Lindisf. p. 252).

As a litter for horses, "fern" is in great request in many parts of Wales, Scotland, and Ireland. While wandering among the mountains of Wales, I have continually met with sleighs, drawn by a ragged pony, and laden with Pteris by an industrious Welshwoman: when thus collected, it is not only used for litter, but is also chopped up when dry, and mixed with straw or hay, and given in winter to the little horses and mules kept for working on the tram-roads. In Scotland, particularly in the western Highlands, I often noticed it in use as a thatch for cottages; and Lightfoot remarks,—"In Glen Elg, in Inverness-shire, and other places, we observed that the people thatched their houses with the stalks of this fern, and fastened them down with ropes made either of birch-bark or heath; sometimes they used the whole plant for the same purpose, but that does not make so durable a covering."—Flor. Scot. ii. 659. It would appear that formerly it was in common use in England, for the same purpose; for by a statute for regulating the price of labour in England, dated 1349, being the 23rd of Edward III., we find it enacted, that every tyler or coverer with straw or *fern* shall receive 3*d.* per day, and their servants or knaves 2*d.* per day, and their boys $1\frac{1}{2}d.$ per day.

Lightfoot goes on to say that swine are fond of the roots if boiled in their wash; and Mr. Edwin Lees has recorded in the 'Phytologist' (263), that in the Forest of Dean he saw some girls carrying a quantity of recently cut Pteris aquilina or farn, which they retailed at 2*d.* per bushel. On inquiring the use

for which it was intended, he was informed that it was extensively employed in the forest for feeding pigs, which are very fond of it: for this purpose, however, it must be cut while the fronds are still uncurled, and must be boiled. The slushy or mucilaginous mass thus produced is consigned to the wash-tub or other receptacle, and in this state it will keep as pig-food for a considerable length of time. Mr. Lees was informed that it was found very serviceable, especially to cottagers, as coming in at an early period of the summer, when the produce of the garden is generally scanty. Mr. Lees suggests that it might not be an unpalateable accompaniment to a rasher of bacon; but its use as an article of human sustenance is not quite so questionable as it would be if dependant on this ingenious speculation. We learn from Lightfoot, that it has not unfrequently occurred that the poorer inhabitants of some parts of Normandy have been reduced to the miserable necessity of mixing the large and succulent rhizomes of this fern with their bread; and in Siberia, and some other northern countries, the inhabitants brew them in their ale, using one-third of these rhizomes to two-thirds of malt.

The ancients also are said to have used both the rhizomes and fronds of this fern in decoctions and diet-drinks, in chronic disorders of all kinds, arising from obstructions of the viscera and spleen. Some of the more modern writers have given it a high character for the same purposes, but it is now falling into disuse among medical practitioners: the country people, however, in Haller's time, still continued to employ it for its ancient uses, and gave it as a powder to destroy worms; they also regarded a bed of the green fronds as a sovereign cure for the rickets in children: probably these uses are still in vogue. Its astringency is so great, that it is used in many places abroad in dressing and preparing kid and chamois leather. In the 'Phytologist' (iv. 1065), Dr. Lindsay adds that the common brakes "is very astringent, containing a considerable amount of tannic and gallic acids; hence it has been greatly used as an anthelmintic." The rhizome, however, is said to be poisonous to cattle, and to produce the trembles in sheep; see Walker's Mam. Scot. pp. 513 and 525.

THE PARSLEY FERN, (*half the natural size*).

ROCK BRAKES.

Characters.

Genus. — ALLOSORUS. Midvein distinct, lateral veins free: involucre not apparent: capsules in circular clusters near the extremity of the lateral veins, which are often divided: epidermis prolonged, bleached, reflexed, entire, and covering the capsules in the manner of an involucre.

Species. — CRISPUS. Caudex prostrate: stipes as long as the frond: fronds of two kinds, both deltoid, and divided into numerous, leaf-like, stipitate divisions.

Synonymes, Figures, &c.

Osmunda crispa, *Linn. Sp. Pl.* 1522; *Lightf. Fl. Scot.* 655; *Huds. Fl. Ang.* 450; *Bolt. Fil. Brit.* 10, t. 7.

Pteris crispa, (*Linn. MSS.*); *With. Arr.* 761; *Sm. E. F.* iv. 319, *E. B.* 1160.

Cryptogramma crispa, *Mack. Fl. Hib.* 313; *Franc.* 57; *Hook. and Arn.* 575.

Allosorus crispus, (*Bern.*); *Newm. N. A.* 13, *F.* 103; *Bab.* 408; *Moore*, 58.

This species appears to have perplexed botanists greatly as to the genus in which it ought to be placed. Linneus made it an Osmunda; but in a MS. note to his private copy of the 'Species Plantarum,' he transfers it to Pteris. By a reference to the preceding list of synonymes, it will be seen that our British authors, Lightfoot, Hudson, and Bolton, adopt his first view, Withering and Smith his second.

The figures of this very pretty little fern are generally characteristic: those in Bolton's 'Filices' (tab. 7), the 'Flora Danica' (tab. 496), and 'English Botany' (tab. 1160), are very praiseworthy. Our old friend, Gerarde the herbalist, seems to have omitted it altogether, nor can I find it in Parkinson; but the 'British Herbal,' to which I have already alluded, describes and figures the species very tolerably.

Roth makes this fern an Onoclea, associating it with O. Struthiopteris, the Struthiopteris germanica of later writers; his description of the fructification is admirably clear and correct, in this respect differing from that of all his predecessors. By three eminent botanists it has been made the type of a new genus, namely, by Bernhardi, under the name of Allosorus; by Desvaux, under the name Phorobolus; and by Robert Brown, under the name Cryptogramma. Of these three names, Allosorus has been adopted on the ground of priority, by Sprengel, George Don (in Loudon's 'Hortus Britannicus'), Sadler, Presl, the compilers of the 'Edinburgh Catalogue,' and Babington; and Cryptogramma by Hooker and Mackay.

Geographical Range.

As far as our very imperfect knowledge of fern-geography extends, the parsley fern is confined exclusively to Europe. It is recorded in one or other of the continental Floras as a native of Norway, Lapland, Sweden, Denmark, Germany, France,

Spain, Switzerland, Italy, and Hungary: although it grows abundantly on the Swiss and French Alps, as well as on their immense shoulders which stretch down into Piedmont, it is, like Gymnogramma leptophylla, omitted from Godet's 'Flore du Jura.' I have seen no corresponding form from the continent of America, nor have I any evidence of its existence in Asia, the plant located in Siberia under this name by Kaulfuss, having been subsequently referred to another species, the Allosorus foveolatus of Ruprecht, (Beitr. z. Pflanzeck. d. Russ. iii. 46). The Russian habitat at the head of the Gulf of Bothnia, I have omitted *as Russian*, and inserted as *Lapp*, adopting the geographical rather than the political position of the station: the species is nevertheless likely to occur in Russia proper, although unrecorded by the accurate and pains-taking Ledebour, except as Lapp.

In Britain it is a local rather than a rare fern.

In Scotland it is scattered over most of the counties in spots; more frequently ornamenting stone walls at a moderate elevation, than growing on the exposed summits of the hills: the Scotch localities are far too numerous to particularize.

Descending into England, we find it recorded by Dr. Johnston as a native of Berwickshire, and by Mr. Winch as growing abundantly on some of the mountains of Northumberland. In Cumberland it is an abundant fern: Mr. Watson, the Rev. G. Pinder, the late Mr. S. Gibson, and many other botanists, have obligingly sent me many Cumberland stations, among which I may mention in particular the neighbourhood of Keswick and Derwentwater, Scawfell Pikes, Helvellyn, Skiddaw, Martindale, Ennerdale, and Borrowdale. In Durham, Teesdale is recorded on the authority of Mr. Babington; and rocks at Cocken and walls near Cronkley Fell in the 'Botanist's Guide.' In Westmoreland, Miss Beever finds it plentifully near Ambleside, and, with her accustomed liberality, has sent me a series of beautiful specimens: the Rev. Mr. Pinder also finds it on the schistose or slate rocks in the same vicinity; Mr. Hindson finds it at Casterton and Old Hutton; Mr. Coventry at Morland. From Yorkshire I have received a great number of specimens through the kindness of my friends: the chief stations are Fountain's Fell; Haworth, near Halifax; Wensley Dale; Cronkley Scar; a number of stations in Teesdale; many spots on Ingleborough; Penhill, and about the neighbourhood of Settle. In Lancashire it is very abundant. Mr. Simpson informs me that on the Moors near Lancaster it grows at a very slight elevation above the sea-level; Mr. W. Wilson found it in the same neighbourhood, on the road to the

Asylum; the Rev. Mr. Pinder and Miss Beever upon the Old Man Mountain; the late Mr. S. Gibson and Mr. Gutch have collected it at Cliviger, near Todmorden, and at Thevely, near Burnley; Mr. Sidebotham and Dr. Wood at Fo-edge, near Bury. In the English counties southward of Lancashire and Yorkshire it is a fern of excessive rarity. We find it recorded for Cheshire, in the 'Botanist's Guide,' as occurring on the top of Tag's Ness, a hill near Macclesfield. The same authority gives Chinley Hills, near Chapel-le-Frith, in Derbyshire. In Shropshire, following the steps of Messrs. Cameron, Westcott, Westcombe, Burlingham, and Southall, I found it during the past summer on the Titterstone Clee Hill, where it occurs sparingly in four widely separated stations, amongst the masses of basalt that characterize that remarkable district. In Worcestershire, Mr. Lees records that he found it very sparingly on the Herefordshire Beacon, one of the beautiful range known as the Malvern Hills: it grows only in one spot, and there were but very few plants, one of which he most kindly gave me. In Somersetshire, Mr. Nathaniel Ward found a few plants about a mile from Simmon's Bath, growing on a stone wall at Challicombe, in company with Polystichum alpinum. The probability of this pretty little fern maintaining a standing in these outlying stations is, I fear, very small; I believe it is already lost in Derbyshire and Worcestershire.

In Wales the parsley fern occurs sparingly in the Snowdon district, also in a few other parts of Caernarvonshire, and in Denbighshire, Montgomery and Merioneth: in the last-named county, I found it on stone walls near Dolgelly, and on the ascent as well as summit of Cader Idris. In South Wales it is comparatively rare; but I am indebted to Mr. Edward Young for a specimen gathered in Glamorganshire.

In Ireland, the range of the parsley fern is still more restricted than either in England or Wales. Mr. Mackay speaks of it as abundant on the Mourne Mountains, in the county Down, but this appears a mistake; it has occurred there, but, so far as I can ascertain, very rarely. The late Mr. Thompson, of Belfast, whose recent loss as a most zealous naturalist Ireland has so much reason to lament, when in company with Mr. Templeton (another Irish botanist, now, alas! lost to science), Mr. Mackay and Dr. Stokes, found it sparingly in the crevices of rocks about the summit of Slieve Bignian, in the same county; but they spent ten hours in an unsuccessful attempt to rediscover it on the Mourne range. Mr. Moore, of Glasnevin, found a very few plants within the liberties of Carrickfergus, in the county Antrim; and Mr. Thompson found one specimen on Carlingford Mountain, in the county Louth.

Description.

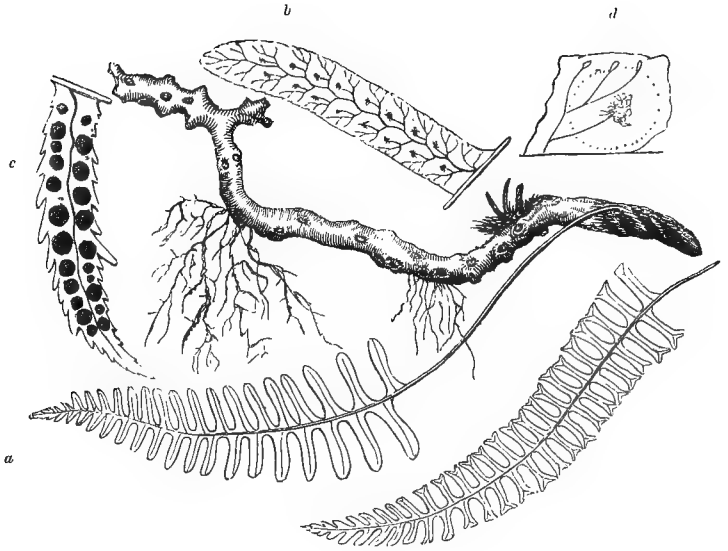
The principal characters by which to distinguish this plant from other British Polypodies, are, that its fronds are both barren and fertile, and that the margins of the pinnules in the fertile frond are inflexed or convolute, covering the clusters of capsules. I have to acknowledge my obligation to the late Mr. Samuel Gibson, as well as to Miss Beever and Mr. Cruickshank, for fronds partially fruited and partially barren.

The radicles are fibrous, numerous, tough, and adhere tenaciously to the earth or stones: the caudex is procumbent, extending itself horizontally, and producing a constant succession of fronds from its crown: this procumbent or horizontal position appears to me rather the result of age, or want of power to maintain an erect position, than of a tendency to a creeping habit. The fronds rise in May and June, and disappear at the commencement of winter: as before stated, they are of two kinds, fertile and barren, both being nearly triangular in form, and, like the frond of Adiantum Capillus-Veneris, they are composed of numerous, leaf-like, ultimate divisions: the pinnæ, pinnules, and ultimate divisions, are arranged alternately: the stipes is slender, smooth, pale green, and is generally much longer than the frond, which is of a bright and delicate green colour. The ultimate

divisions of the fertile fronds are of a somewhat oval form, and stand on distinct petioles, as shown at figure *a*, (page 39); their margins are inflexed or convolute, attenuated and bleached; figure *b* is a magnified representation of one of these little leaves, with its margins rolled over as in a state of nature. The midvein is flexuous, and bears eight or ten lateral veins, placed alternately; these are divided shortly after leaving the midvein, and each branch bears a nearly circular cluster of capsules at or very near its extremity, which does not quite reach the margin. The ultimate divisions are frequently auricled near the footstalk on one side only; this is shown in figures *c*, *d*, and *e*: *c* represents the margins as flattened, and the clusters of capsules consequently uncovered; at *d* the margin is flattened on one side only; at *e* both margins are shown as flattened, the capsules removed, and only the points of their attachments indicated, together with the veins on which they are placed. The character of the barren frond is very various: its appearance is generally crowded and crisped, like the leaves of parsley, but its ultimate divisions are much the same with those of the fertile frond. Three forms of the barren frond are represented at *f*, *g*, and *h*; all these are of common occurrence: in *f*, the ultimate divisions are formed like little oak leaves; the venation of one of these magnified is shown at figure *i*: *g* represents a frond in which the ultimate divisions are nearly linear: *h* is a form of less common occurrence, yet rarely absent where the plant is growing in considerable quantities.

Culture.

There can scarcely be a more ornamental or more hardy fern than this when cultivated on rock-work: its beautifully green colour forms a most cheerful and pleasing contrast to the dark masses of basaltic or granitic rock amongst which it is placed by Nature, and should be placed by man. The soil in which it succeeds best is the peaty bog-earth known so well by nursery-men as the proper soil for Rhododendrons, Kalmias, and heaths: it should be sparingly supplied, and whether the fern be cultivated in pots or in the open ground, a large proportion of small pieces of stone should always be used.



COMMON POLYPODY, (*one-fourth the natural size*).

Characters.

Genus. — CTENOPTERIS. Midvein distinct: lateral veins of the pinnæ or pinnules branched, free, swollen or capitate at their extremities; the anterior branch simple, generally terminating midway between the midvein and the margin, bearing a cluster of capsules at its extremity; the posterior branch is twice or thrice dichotomously divided, the capitate extremities usually forming a line parallel to the margin: involucre none: caudex a stout succulent rhizome, usually attached by means of its radicles to the surface of a rock, the bark of a tree, &c., thus always having a pseudo-parasitic or climbing appearance, cylindrical, branched, extending itself at the extremities, at first densely clothed with scales, but as these fall off becoming smooth and naked; of slow growth, tough and very enduring, here and there marked with nearly circular scars, the site of fallen fronds, which, though persistent through the winter, are

deciduous in early summer, falling off at a basal articulation.—See Phytol. ii. 274.

Species.—VULGARIS. Frond strap-shaped, simply pinnatifid, stipitate: stipes articulated at the base.

Synonymes, Figures, &c.

Polypodium vulgare, *Linn. Sp. Pl.* 1544; *Lightf. Fl. Scot.* 667; *Huds. Fl. Ang.* 455; *With. Arr.* 773; *Sm. E. F.* iv. 280, *E. B.* 1149; *Mack. Fl. Hib.* 337; *Franc.* 21; *Newm. N. A.* 13, *F.* 111; *Hook. and Arn.* 566; *Bab.* 408; *Moore*, 43.

Polipodium vulgare, *Bolt. Fil. Brit.* 32, t. 18.

Polypodium Ctenopteris vulgare, *Presl. Tent. Pterid.* 179.

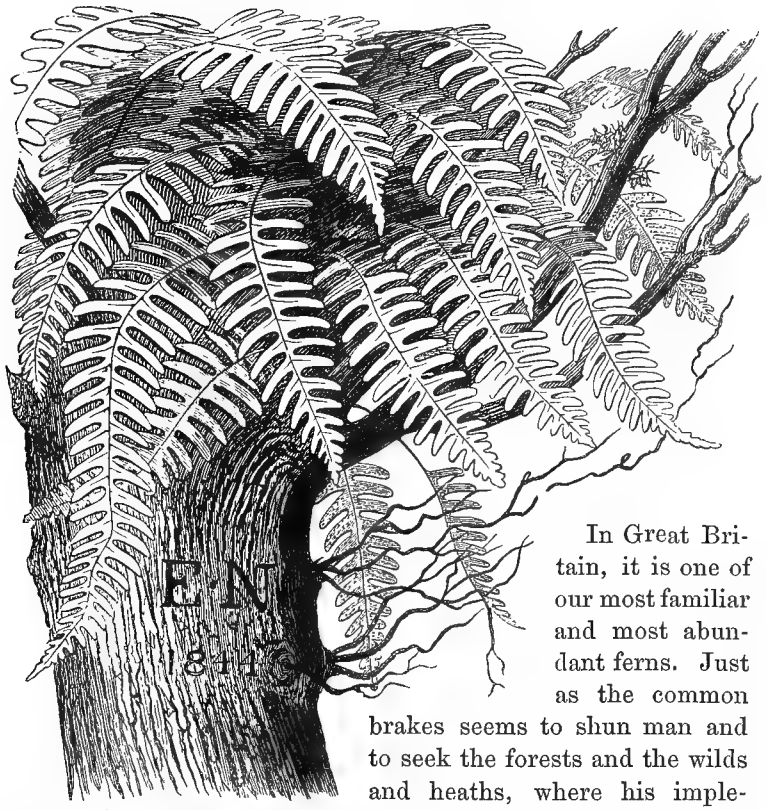
Ctenopteris vulgaris, *Newm. Phytol.* ii. 274, *App.* xxix.

This genus is indicated by Presl, under the name of Polypodium Ctenopteris vulgare; and he has arranged under the section Ctenopteris fifty-three species, which agree in the following character: — "Sori aut omnes aut saltem superiores in apice globuloso venæ venulæve." And although the assemblage, at first sight, certainly appears heterogeneous, yet the character, if constant, and combined with the still more important one derived from the rhizome, is not to be rejected, however much the group of included species may require revision. I am not aware that the species, in its normal form, has ever had a second name.

All the figures of this fern are good, and some of them beautifully characteristic: none however surpass in fidelity those by Gerarde of the usual form; (see Gerarde Em. p. 1132, both figures). It is very marked in character, and therefore easy to represent.

Geographical Range.

The common polypody is perhaps the most universally distributed of all ferns: it grows in every province of Europe and Asia between the German and North Pacific Oceans; it occurs in many parts of Africa, and throughout the continent of North America.



In Great Britain, it is one of our most familiar and most abundant ferns. Just as the common brakes seems to shun man and to seek the forests and the wilds and heaths, where his implements of husbandry offer it no disturbance; so does the polypody appear to affect the companionship of man, to shun the waste, and to claim the shelter of the hedge-row: it forsakes the common, and establishes itself on the church tower or the church-yard wall: it especially delights in the stone roofs of our cottages: it leaves the forest tree to rejoice in its vigour, but surrounds with a verdant crown the pollard willows that fringe the margins of our mill-streams or overshadow our horse-ponds. It is emphatically a parasite, a parasite moreover on the weak; and when it occasionally makes its appearance far away from man and the works of man's hands, it is sure to be found clinging to some giant of the forest that is hastening to ruin. Such an one it will often crown with joyous green, — invest with

"A gilded halo hovering round decay."

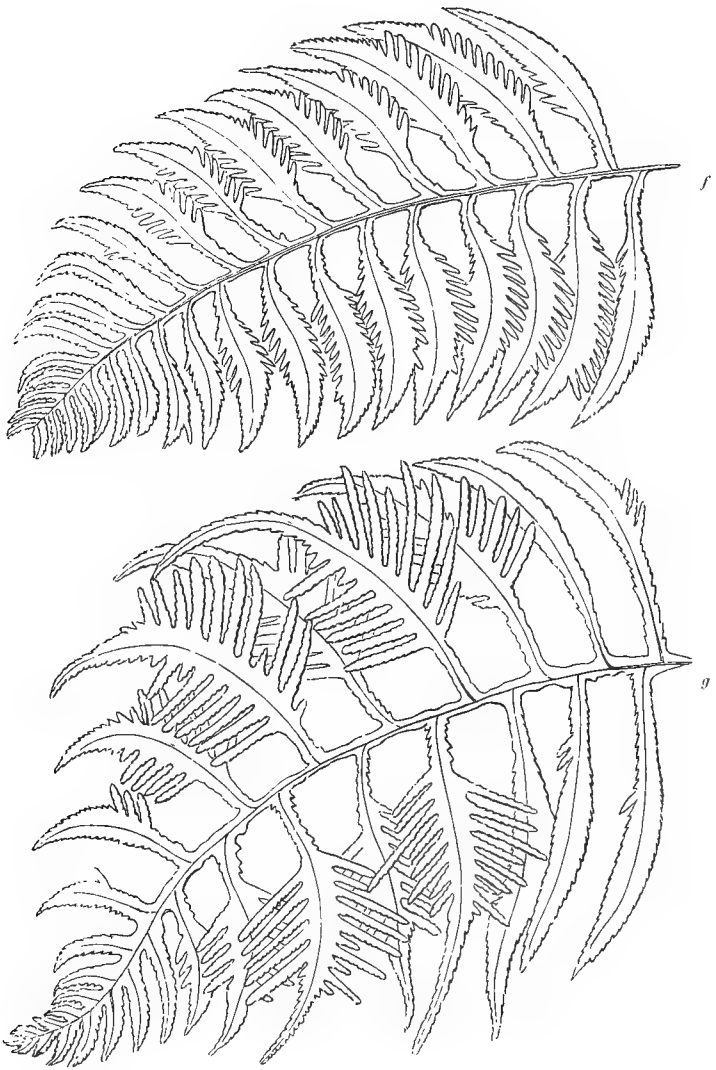
Description.

The radicles are brown, and thickly clothed with fibrillæ: the caudex is a rhizome, about the size of a goose-quill, and entirely covered with a dense, brown, pilose cuticle, which dries up and peels off after one year's growth, leaving the rhizome smooth; it is decidedly creeping, making annual advances of considerable extent. The young fronds are thrown out in May and June, and never issue from the growing point of the rhizome, a character which will hereafter occupy the attention of all pteridologists: they arrive at maturity early in September, and retain their full vigour until the fronds of the succeeding year make their appearance. The young fronds are generally erect at first, but droop by degrees, and are always pendent when mature. The stipes is green, and nearly equal in length to the frond: the frond is strap-shaped, pinnatifid, and acute at the apex, (fig *a*, page 41): the pinnæ are nearly linear, and rounded at the apex; their margins are more or less serrated: the usual size is shown in the detached pinnæ, represented by figures *b* and *c*, (page 41). The fronds are fertile only, and the clusters of capsules are generally confined to the upper part of each: when without fruit, the imperfection arises from uncongenial situation, and the plant is not to be considered in a perfectly natural and healthy state. The situation of the veins is shown in the detached pinna, (fig. *b*): the lateral veins are alternate, and each is divided into four branches, three of which extend nearly to the margin, and are incrassated at their termination; the fourth is directed forwards, and its termination, which is nearly equidistant from the midvein and the margin, bears a circular cluster of capsules, which is entirely without an involucre. A single lateral vein, its four branches, the attachment of the capsules, and the extent of the circular cluster, indicated by a dotted line, are shown at fig. *d*. (page 41).

Varieties.

In form of frond the common polypody is tolerably uniform; it is, however, subject to a few variations, some of which are

remarkable. The detached pinna bearing the clusters of capsules (fig. *c*), shows a strongly serrated variety; and the entire



frond (fig. *e*) has the termination of the pinnæ bifid. Another variety, which is perfectly barren, is so strongly serrated, that

Linneus considered it a distinct species, and described it under the name of Polypodium Cambricum: the identical frond so named and described by the great naturalist, is now in the possession of the Linnean Society of London. Figure *f*, on the preceding page, is a careful representation of this frond. I have never been successful in my search for this form of the common polypody in *Wales*, but have seen in many botanic gardens fine *Irish* specimens, and am indebted to Mr. Moore, of the Dublin Glasnevin Garden, for a root found in the county Wicklow many years since: it is still in full vigour, and its remarkable character is perfectly unchanged by cultivation. The late Mr. Thompson, of Belfast, informed me that a similar plant was found by the late Mr. Templeton, in a glen at Red Hall, near Carrickfergus, county Antrim. Figure *g* represents a still more remarkable variety, found by Mr. Mackay, in the Dargle, in the county Wicklow; the frond represented was sent by Mr. Mackay to the late Sir J. E. Smith, and is also in the possession of the Linnean Society: it differs from the preceding variety in being fertile. In Ireland this species is much more subject to vary than in England. I have gathered a number of fronds in various parts of the county Kerry, which bear some slight resemblance to Mr. Mackay's beautiful plant. I must not, however, omit to record my thanks to Mr. George Smith, of Monkston Hill, near Dublin, for magnificent examples of this variety; to Dr. Greville, for a gigantic English specimen gathered at Sidmouth; to Mr. Jenner, for another gathered in Kent; and to Mr. W. Southall, jun., for others, deeply serrated, gathered in a lane at Moseley, near Birmingham.

Culture.

This fern is one which thoroughly repays the trouble of cultivation. Some care is required in removing it from its native habitats: it frequently occurs with its rhizomes so closely interlaced with the roots, branches, or bark of the decaying tree on which it is growing, that a saw or chopper is required for its removal. In a greenhouse, it is a remarkably striking and beautiful object when suspended in a basket, which should

always be of wood, and made very open. The basket and suspending wire being prepared, the rhizomes should be arranged therein in such a manner that the fronds may pass through the holes in the bottom, and that the growing points of the rhizomes may also have an opportunity of doing so. The rhizomes should then be covered with a thin layer of Sphagnum, a moss always to be found in boggy places, and which never becomes mouldy: next cover the Sphagnum with a mixture of well-decayed leaf-mould and silver sand; then arrange a second layer of Sphagnum, and then a second layer of rhizomes, on which carefully fasten wooden cross bars, and the basket will be complete. Immerse the whole in soft water, until it is thoroughly saturated, and then suspend it in its final destination. This should be done in April, before any young fronds have appeared: in June and July young fronds will emerge through all the apertures in the basket, and will arrange themselves gracefully around it: last year's fronds, which, up to this period, are unsightly, will now fall off. The basket should hang in a free circulation of air; all glass covering, more than that afforded by a greenhouse with open doors and windows, is to be avoided: exclude violent draughts of wind, such as are likely to break the fronds, but admit plenty of fresh air. The polypody may also be cultivated in pots, recollecting to introduce abundance of decaying wood and leaf-mould.

Out of doors this fern does well, if removed in a compact mass from a wall or roof to a slab of stone in the rockery; or, better still, if you can obtain leave, in early spring, to saw off the head of some pollard willow, and transfer the mass uninjured to your garden.

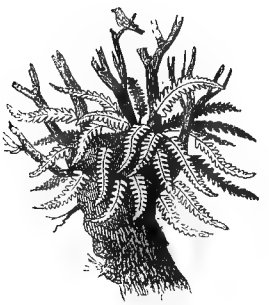
Economical Uses.

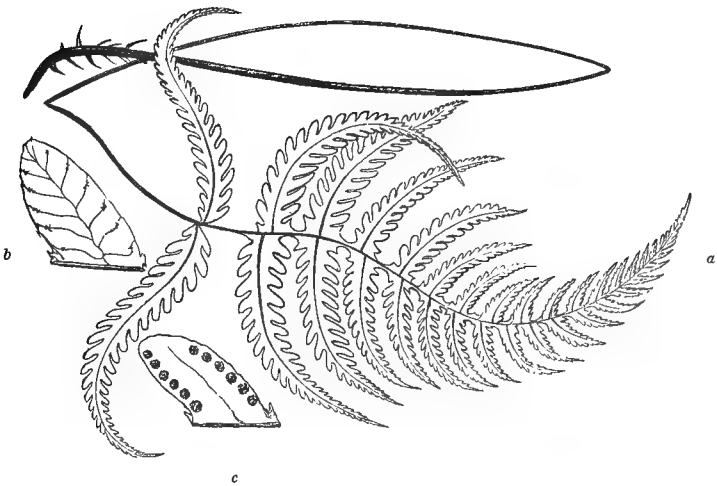
The medicinal properties of the common polypody were once highly extolled, but the plant is now fast falling into disrepute amongst medical men. A mucilaginous decoction of its fronds was formerly very commonly administered to children as a cure for worms, colds, and the hooping-cough; and I have seen elderly women collecting it in Herefordshire, as a specific against the latter disease. It is gathered in October and November,

when full of seed, the barren fronds being rejected; it is hung up in the cottages to dry, and when required for use, is slowly boiled with coarse raw sugar. It is called by these gatherers, "golden locks," and "golden maiden-hair."

The virtues formerly attributed to this plant were very numerous. Dioscorides says it is of service applied to luxations or limbs out of joint, and to chaps between the fingers; and that it has the power to purge and draw forth choler and phlegm. Actuarius asserts that it purges melancholy, as we learn from Gerarde; but he adds that Joannes Monardus thinks its powers of purging very small, a view of the case which our great herbalist informs us "is confirmed by Experience the mistris of things." Pliny recommends it for chaps on the toes; and farther informs us that the root dried and powdered, and snuffed up the nose, will consume a polypus. It is, doubtless, the "Rheum-purging Polypody" of our own Shakspere.

The dried and powdered rhizome was formerly applied "externally as an absorbent, and for covering pills," as we are informed by Dr. Lindsay; (Phytol. iv. 1065).





THE BEECH FERN, (*natural size*).

Characters.

Genus.—Gymnocarpium. Ultimate divisions of the frond with a series of free parallel veins running from the midvein to the margin, and each of these bearing a circular mass of capsules before its extremity; when mature, these clusters are circular, and, in the typical species, have no trace of an involucre. The caudex is a black, slender, stolon-like rhizome, which extends rapidly beneath the surface of the ground, the fronds rising from its extremity.

Obs.—It should here be observed that Roth, one of the most painstaking and observant of botanists, asserts that he found an involucre in Phegopteris and Dryopteris. I have no reason to doubt this assertion, but have not confirmed it by my own observation. An involucre is frequently present in montana, and is such as is described by Roth as characteristic of Phegopteris.

Species. — Phegopteris. Rhizome creeping: stipes long: frond ovate-deltoid, pinnate, drooping: first pair of pinnæ sessile, distinct, turned back; the rest confluent, being united at

the base, pointing forwards; all pinnatifid: colour dull green: stipes concolorous, slightly scaly.

Synonymes, Figures, &c.

Polypodium Phegopteris, *Linn. Sp. Pl.* 1550; *Lightf. Fl. Scot.* 669; *Huds. Fl. Ang.* 456; *With. Arr.* 775; *Sm. E. F.* iv. 282, *E. B.* 2224; *Mack. Fl. Hib.* 337; *Franc.* 23; *Newm. F.* 115; *Hook. and Arn.* 566; *Moore*, 47.

Polipodium Phegopteris, *Bolt. Fil. Brit.* 36, t. 20.

Aspidium Thelypteris, *Sm. E. B.* 1018.

Lastrea Phegopteris, *Bory, Dict. Class. d'Hist. Nat.* ix. 252; *Newm. N. A.* 17, *F.* 13.

Polypodium ? Phegopteris, *Bab.* 408.

Gymnocarpium Phegopteris, *Newm. Phyt.* iv. 371, *App.* xxiii.

Polystichum Phegopteris, *Roth. Fl. Germ.* iii. 72.

The ferns for which I propose the generic name of Gymnocarpium, form a small, but, as it appears to me, a very natural group. Most of our authors, modern as well as ancient, include them, together with the last-described species, Ctenopteris vulgaris, and also Pseudathyrium alpestre hereafter to be noticed, in the genus Polypodium. My late friend, Colonel Bory de St. Vincent, when he established the genus Lastrea in 1824, mentioned only two European species, Oreopteris and Thelypteris, as referrible thereto; but two years subsequently, namely, in 1826, he added three others,—Phegopteris, Dryopteris and Robertianum: and every botanist will admit that there is great similarity in structure amongst all the five species, and that they associate very naturally: nevertheless, I think it better to separate the species into two groups, until there is a greater fixity in the characters and limits of the genera of ferns.

The specific name of Phegopteris is of universal acceptation, although both this, and the English name of "beech fern," a literal translation, seem very inappropriate, as was observed by the late Sir J. E. Smith; and I feel at a loss to discover the reason for either having been employed. Both of them convey an obviously incorrect impression, as neither the characters nor localities of the fern have any connexion with the beech tree.

The figures of the beech fern are not, generally speaking, satisfactory, inasmuch as they fail to give the very marked character which distinguishes this truly graceful fern: its long stipes, subtriangular figure, and the unusual direction, and complete separation of the lowest pair of pinnæ, are very striking characteristics. In 'English Botany' it seems to have been figured twice, first under the name of Aspidium Thelypteris (E. B. tab. 1018), and secondly, under that of Polypodium Phegopteris (E. B. tab. 2224); neither of these figures is very successful. In Bolton's 'Filices' (tab. 20) the figure is far from characteristic; and Mr. Francis (Analysis, pl. 1, fig. 3) has, if I mistake not, figured an American species in its stead.

Geographical Range.

Gymnocarpium Phegopteris is recorded as a native of every country in Europe, except Turkey and Greece; Ledebour, in his 'Flora Rossica,' gives the Altai Mountains, Lake Baikal, Kamtkatcha, and Unalaska, as Asiatic habitats; and Col. Bory de St. Vincent found it in Algeria. Through the kindness of my correspondents, Mr. Boott and Mr. Lea, I have received a species from many and distant stations in the United States, which I cannot distinguish from G. Phegopteris.

In Great Britain it takes a range very similar to that of Allosorus crispus: in Scotland it is found in every county north of the Firth of Forth; also in the Shetlands, Hebrides, and Orkneys: it is very common in the western Highlands, and enjoys a great range of elevation: it occurs near the summit of Ben More, Ben Lomond, and Ben Cruachan, and descends to nearly the sea-level on the banks of Loch Lomond and Loch Fyne.

In England, beginning with the far North, we find it recorded by Dr. Johnston for Berwickshire; by Mr. Winch for Northumberland; by the Rev. Mr. Pinder, Mr. Heysham, and many others, for Cumberland; by Mr. Bowman for Durham; by Miss Beever, Mr. Hindson, Mr. Thompson, and many others, for Westmoreland; by Mr. Hardy, Mr. Tatham, and a great many others, for Yorkshire; by Mr. Wilson, Mr. Sidebotham, Dr. Wood, and many others, for Lancashire. At this point we come to a check: it occurs but sparingly in Cheshire, for which county three localities

only are recorded: Mr. Pinder finds it at Mow Cop, Mr. Sidebotham at Werneth, and Mr. Bradbury, according to the 'Botanist's Guide,' in Early Banks Wood, near Staley Bridge, Dr. Wood informs me that he found it in profusion on the limestone rocks in Derbyshire; Mr. Pinder has found two localities in Staffordshire,—Ridge Hill and Madeley Manor; it occurs in company with Allosorus crispus on the Titterstone Clee in Shropshire, and Mr. Westcott has also found a station nearer Ludlow; I have found it abundantly near Amestrey quarry, in Herefordshire. The following record of its discovery in Gloucestershire is interesting:—"During a day's excursion in the Forest of Dean this summer, I had the pleasure of very unexpectedly meeting with that elegant fern Polypodium Phegopteris. About a mile and a half above Lydbrook, towards Coleford, out of a low wall by the road-side, grows Polypodium calcareum. The station for Phegopteris is nearly opposite this, on the other side of the road, a short distance within the wood. It is growing among bushes, in a boggy bit of ground; I think in rather an unusual position, its favourite habitat being among moss on rocks and stones, amid the spray of waterfalls. Although a considerable patch of a hundred or two fronds, it had not attained to near that luxuriance and size of frond which makes it such a beautiful object in some more mountainous parts of the country. But it is an interesting addition to the ferns of Gloucestershire, in which county I am not aware that it has been previously recorded."—Mr. E. T. Bennett, in Phytol. iii. 741. In Devonshire, there are some dozen or more well-authenticated habitats for this fern: Mr. Ralfs has discovered it in many and distant stations on Dartmoor; Mr. Babington at Sheep's Tor; Miss Hill at Ilfracombe; the Rev. W. S. Hore on the summit of Cock's Tor; Mr. Kingston at Becky Falls. In Cornwall, Mr. Borrer found it at Tintagel, on the road towards Camelford; and, finally, it has been discovered in two widely separated localities in Sussex: first, by Mr. Jenner, "in a boggy spot on the forest, near Kidbrook Park pales, Forest Row"; and, secondly, by Messrs. Lloyd and M'Ennes, near the Balcombe station on the London and Brighton Railway:—"In a somewhat shady portion of elevated ground, at a distance of about two miles from Balcombe, and near the line of the tunnel, we had the good fortune to find Polypodium Phegopteris in the most beautiful condition. The fronds were unusually large and luxuriant, averaging, when measured, together with the long naked stipes, more than two feet in length. Its luxuriance and delicate colour combined to render it a beautiful and truly interesting object."—J. Lloyd and K. M'Ennes, in Phytol. iv. 607. In consequence of this record, many readers of the 'Phytologist' have been to the station indicated, and have found the species in great profusion; indeed, I incline to believe, it is generally distributed over the forest in the Balcombe vicinity.

In North Wales I have noted upwards of thirty stations where I have myself observed it; and at least an equal number have been recorded for South Wales.

In the Isle of Man it has been found by Professor E. Forbes.

In Ireland, the beech fern is of rare occurrence, and appears to grow nowhere abundantly. During a ramble of eight weeks in that beautiful island, I was never successful in finding it, although I examined many stations that I thought well adapted for it; others, however, have been more fortunate. Mr. Mackay found it at the waterfall above Lough Eske, in the county Donegal; the late Mr. Thompson met with it on the banks of the Glenarve river, half a mile from Cushendall in the county Antrim; and Mr. Moore, of Glasnevin, observed it at several mountain rills and waterfalls in the same county. Mr. Thompson also gathered specimens upon Slieve Bignian, on rough ground two miles south of Slieve Croob, and on the Black Mountain, above Tollymore Park, all in the county Down: and on Carlingford Mountain, in the county Louth. My friend, Mr. E. T. Bennett, informs me that he has specimens collected on Garoom Mountain, Letterfrack, in Cunnemara, by Mr. Ellis. The late Dr. Taylor found it near Mr. Herbert's residence at Muckruss, in Kerry; and Mr. Moore, Mr. Ward, and Dr. Harvey have observed it in the neighbourhood of Killarney. The late Mr. Templeton found it in Glen Ness, in Londonderry; and, lastly, Mr. Mackay, and a number of botanists and tourists following his footsteps, have observed it at Powerscourt waterfall, in the county Wicklow.

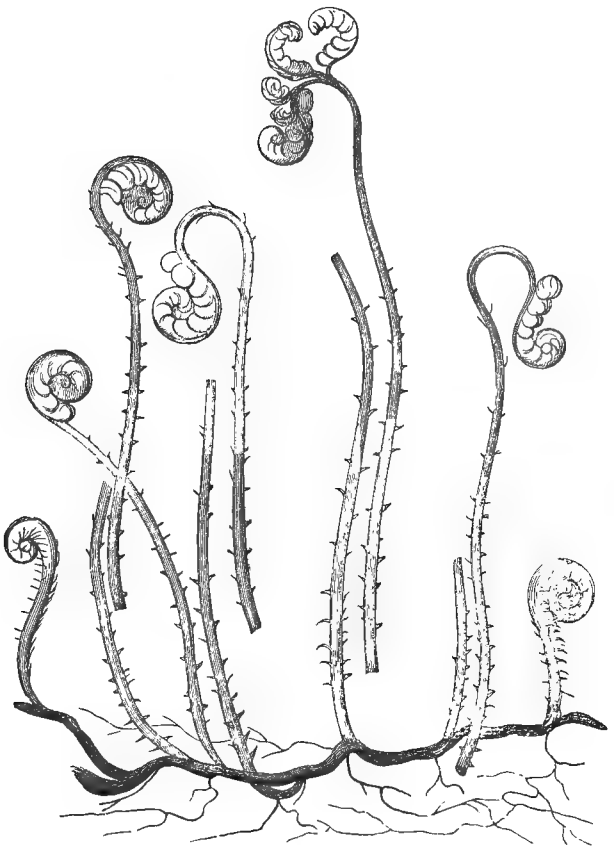
The more abundant distribution of this plant in Scotland and the North of England, leads one at first to regard it as a boreal, or, at least, as an alpine species; but this conclusion seems to be erroneous. My brother, who, as an invalid, resided for several years in the South of France, brought home specimens from Ax, Grasse, Montpellier, and Toulon; at the last-named town it grew almost at the sea-level, in company with Adiantum Capillus-Veneris; the late Col. Bory de St. Vincent also found it on the Mediterranean coast, both French and Algerian: and the most boreal or alpine *recorded* French locality is in Auvergne. I know nothing of the conditions under which it occurs in Italy and Spain. In Great Britain it affects wet woods and waterfalls, delighting to wave its peculiarly graceful fronds within reach of the spray. In such situations, the rhizome intermingles with the moss, or winds about in the light moist earth, or creeps over the dripping surface of a rock, seeming to rejoice in the humidity of the atmosphere.

As the foregoing observations seem somewhat at variance with the opinions expressed by Mr. Watson, in his 'Cybele Britannica' (iii. 254), I am bound in justice, both to that philosophical botanist and to the reader, to give his observations *in extenso*. "Scottish type of distribution. * * * Native. Rupestral, &c. It may at first appear an error to refer this fern to the Scottish or boreal type of distribution, when the zonal or latitudinal ranges are so wide or general, extending from the coast level to the high mountains, from the South of England to the extreme North of Scotland. It is the great rarity of the plant in the most southerly and south-easterly provinces of England, that suggests the boreal rather than the British type. Of the twenty-two counties included in the four first provinces, four only have been reported to produce this species; and one of these (Middlesex) being little probable, and not certified on sufficient authority, can scarcely be reckoned in the census. Most of the other sixty counties doubtless produce this fern, which has been actually reported from about forty-five of them. I do not know how far South this should be deemed a plant of the coast level. The altitude of its stations in the Channel and Peninsula may not be quite so low as to warrant an indication of the coast level in those provinces. The term 'rupestral' does not very accurately characterize the natural situations for the species; a combination of 'rupestral' with 'sylvestral' and 'uliginal' would be nearer the actual conditions of its growth, — a combination of drainage with shade and humidity."

Description.

The radicles of the beech fern are black and fibrous: its caudex or stolon-like rhizome is wiry, tough, and creeping: the fronds are thrown up in May, rising on erect, succulent, and very brittle stems, clothed with a few pale scattered scales. I have taken some pains to represent these young fronds at page 55, in every stage of development. They unfold with wonderful rapidity, attain perfection in July, and are destroyed by the early frosts on the approach of winter. The position of the frond is at first nearly erect, subsequently horizontal, and

finally pendulous; its size varies from that of the frond represented in figure *a* at page 49, to nine inches in length, exclusive of the stipes. The figure of the frond is triangular, and acute at the apex; it is pinnate, the pinnæ being pinnatifid,



linear, and very acute at the apex: the lower pair of pinnæ are turned back from the apex of the frond; they are sessile, and united to the stipes by the midrib only: the remaining pinnæ point forwards, and are united to the stipes by the whole breadth of their base, and, with the exception of the second and third pair, are confluent with each other: the fronds, including the stipes, are pale green and hirsute, and are fertile only.

The lateral veins of the pinnules are few in number, alternate, almost invariably undivided, and extend to the margin, each bearing a circular cluster of capsules near its extremity; these clusters consequently form a submarginal series: they are of a brown colour. In one of the detached pinnules in the cut at page 49 (fig. *b*), will be seen the position of the veins and the attachment of the capsules; in the other (fig. *c*), the clusters of capsules are represented in their natural situation.

Culture.

The beech fern, to succeed thoroughly in pots, should be cultivated on the following plan. Fill a large flower-pot to the height of three inches with charcoal broken into small lumps; on this arrange some Sphagnum, and cover it with peat-earth having a slight admixture of well-decayed leaf-mould and sand; on this arrange the rhizomes of the ferns, and cover them with the same mixture. The pot should stand in a large feeder, kept constantly full of water. Planted on rock-work and exposed to wind and sun, it soon looks shabby and unsightly, but is very hardy, and will endure for many years if the soil be appropriate, as recommended above, and the supply of water liberal.

OAK FERN, (*one-third the natural size*).

Characters.

Genus.—GYMNOCARPIUM, (see page 49).

Species. — DRYOPTERIS. Rhizome creeping: stipes erect, longer than the frond, purplish, glabrous: frond triple, deltoid, smooth, the three branches pinnate: pinnæ pinnatifid: lateral veins usually simple: involucre generally wanting: clusters of capsules near the extremity of each lateral vein, forming a marginal series: colour bright green.

Synonymes, Figures, &c.

Polypodium Dryopteris, *Linn. Sp. Pl.* 1555; *Lightf. Fl. Scot.* 678; *Huds. Fl. Ang.* 460; *With. Arr.* 780; *Sm. E. F.* iv. 283, *E. B.* 616; *Mack. Fl. Hib.* 338; *Franc.* 24; *Newm. F.* 123; *Hook. and Arn.* 567; *Moore*, 53.

Polypodium Dryopteris, *Bolt. Fil. Brit.* 52, t. 28.

Polystichum Dryopteris, *Roth, Fl. Germ.* iii. 80.

Lastrea Dryopteris, *Bory, Dict. Class. d'Hist. Nat.* ix. 232; *Newm. N. A.* 15, *F.* 13.

Polypodium ? Dryopteris, *Bab.* 109.

Gymnocarpium Dryopteris, *Newm. Phytol.* iv. 371, *App.* xxiv.

The name of "oak fern," derived from "Dryopteris," appears as inapplicable to this species as that of "beech fern" to the one last described, and is adopted in deference to the opinions of others. The scientific name of Polypodium Dryopteris has been employed by all authors of repute, except two:—Roth, who describes it as having an involucre nearly similar to that which he assigns to Gymnocarpium Phegopteris, and who consequently refers it to his genus Polystichum; and Bory, who refers it to his genus Lastrea, as already explained under G. Phegopteris.

The figures of this fern, like those of the one last described, are less characteristic than its remarkable form would lead us to expect: those in Bolton's 'Filices' and 'English Botany' are better than most; but that in Mr. Francis's 'Analysis' is incorrect as regards outline and position, the triple character of the frond not being well expressed: that in 'Flora Danica' is also bad, and is supposed by some subsequent authors to have been intended for the Lophodium multiflorum of this work.

Geographical Range.

The geographical range of this species is very extensive. It is recorded as a native of every country of Europe, except Greece and Turkey, ranging from the North Cape to the rocks of Gibraltar. It is to be regretted that Ledebour, whose admirable summary of habitats adds so largely to our knowledge of the geographical distribution of European plants, should have united Dryopteris, Robertianum, and a third but still more distinct form, the Polypodium disjunctum of Ruprecht (in Beitr. z. Pflanzenk. d. Russ. iii. 52), under the one specific name of Dryopteris: I say regretted, not that I wish to pass any criticism on the mere fact of this union, but that a vast number of habitats are thus lost to those who consider the species distinct, as they cannot be cited with any certainty, the habitats being assigned exclusively to Dryopteris, although that name confess-

edly includes the three supposed species. It occurs in Northern Asia, and Africa: it is also found throughout the United States of North America, ascending to the exposed summits of mountains, and almost reaching the extreme limits of vegetation, yet occasionally luxuriating in woods, if amply provided with moisture for its wandering rhizome.

In Great Britain, its range appears to be more restricted than that of the beech fern. If the island were divided by an oblique but irregular line, composed of the rivers Trent and Severn, and the Bristol Channel, we shall find G. Dryopteris present in most of the counties to the north-west of this line, and nearly absent from those to the south-east: this is the more remarkable, since many situations, especially in Cornwall, Devon, Dorset, Wilts, and Sussex, seem peculiarly adapted for the growth of such a fern; indeed, it has been recorded as growing in Oxfordshire, Wiltshire, Sussex, Essex, Middlesex and Lincolnshire; but in each instance I have had reason to suspect the intentional introduction of the species, or an error in the name, since it certainly requires some proficiency in botany to distinguish between this and the following species. It is one of our most elegant and delicate ferns: like the last, it is almost entirely confined to wild and mountainous districts, wet woods, and the vicinity of waterfalls. On the most bleak and exposed mountains it ascends to a considerable height, sheltering beneath ledges of rock, and under masses of stone.

In Scotland, the localities are extremely numerous, and include nearly all the counties.

England.—Dr. Johnston records half-a-score stations in Berwickshire; in Northumberland, Cumberland, Westmoreland, Durham, Yorkshire and Lancashire, the localities are far too numerous to mention. In Cheshire it is comparatively rare: Mr. Wilson found it of very large size two miles south of Warrington. In Derbyshire the rocks about Pleasley Forges, and Chinley Hill, near Chapel-le-Frith, are recorded in the 'Botanist's Guide' as localities. In Staffordshire, it has been found by the Rev. Mr. Pinder in Trentham Park; by Mr. Beynon in the grounds of the Rev. Thomas Gisborne, of Yoxall Lodge; by Mr. Carter, in a lane leading from Oakamoore to Colton Hall, and also on a stone wall near Colton Hall. In Shropshire, treading in the footsteps of abler men, I observed it abundantly, in company with G. Phegopteris and Allosorus crispus, about the basaltic blocks on the ascent of the Titterstone Clee: it has also been found on the

Hoar Edge, and at Whitcliffe coppice near Ludlow, by Mr. Westcott. In Herefordshire, Mr. Lees observed it in great profusion by the side of a shady path in a wood or copse on the southern side of the Teme, leading from a wooden bridge over the river in Mr. Knight's grounds, and not far from Downton Castle: I have found it near Amestrey quarry, and in immense profusion in Shobden-hill woods; in the latter locality it covers acres of ground, is of small size, and all the divisions of the frond are convex or convolute: Mr. Bennett and Mr. Purchas have also found it sparingly in several woods in the vicinity of Ross; the last-named botanist states that it grows "in shady parts of Penyard, where its habit is very delicate, and very little fruit is produced." In Worcestershire, Mr. Lees finds it plentifully on the Malvern Hills, in a stony ravine between the north and end hills, North of Great Malvern; Mr. Westcombe has found it on the north hill, and in Shrawley Wood: I am indebted to the liberality of the Botanical Society of London for specimens from the first of these localities. In Gloucestershire, Withering has recorded its occurrence in woods north-east of the road up Frocester Hill: Mr. Lees informs me that it grows in the Forest of Dean, south-east of the rocks of New Weir, on the Wye, by a path through the woods towards Staunton: and Mr. E. T. Bennett has found it in woods at the Lea Bailey, and also on Atterbury Hill, above Lydbrook. In Somersetshire, Mr. Flower informs me he has found it in rocky places on the Mendip Hills, also near Bristol and near Bath.

In North Wales, as in Scotland, the localities are too numerous to particularize. In the counties of Denbigh, Caernarvon, Cardigan and Merioneth, I have observed it in more than a hundred localities. In South Wales it is perhaps less abundant, but the recorded localities are very numerous.

The oak fern is the rarest of all the species found in Ireland. Mr. Moore, of the Dublin Glasnevin Garden, has a specimen which he gathered in the county Antrim. Localities have been published in the counties Down, Galway and Kerry; but there is reason to fear that in each instance a mistake has accidentally crept into the record.

Description.

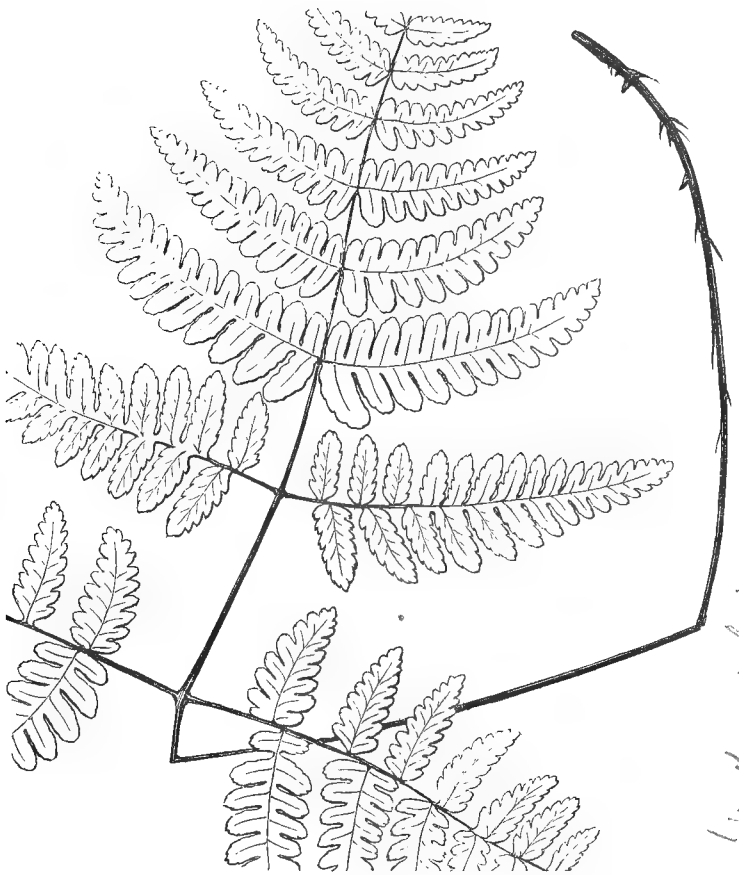
The radicles are black and fibrous: the caudex is a stolon-like rhizome, black, wiry, and creeping, often, when long established, forming a dense matted mass. The young fronds make their appearance in March and April, each at first resembling three little balls on wires, presenting a very curious and excellent diagnostic: these three balls gradually unfold, and

display the triple character of the frond. The fronds soon arrive at maturity; I have found them loaded with ripe seed as early as June: before winter they have entirely disappeared. The stipes is very slender, dark purple, and shining, and is frequently twice as long as the frond; it has a few scattered scales towards the base. The frond is triple, or composed of three distinct triangular portions, each of which has a short but distinct naked rachis, and these three unite with the stipes at an obtuse angle, as represented in the figure at page 57. Each division of the frond is pinnate, and the pinnæ are opposite, pinnate at the base, pinnatifid towards the centre, and terminating in a somewhat acute apex: the basal pinnules are sessile, and of nearly equal size, so that the four occurring at each union of the pinnæ with the rachis, form a cross. The midvein of each pinnule or ultimate division is sinuous, and the lateral veins are alternate and mostly simple; each terminates at the margin, and generally bears a circular cluster of dark brown capsules near its extremity: in some specimens these clusters are so densely crowded as to form a marginal line, in others they are scattered and very distant. The fronds are of a most vivid and beautiful green, in this respect surpassing every other species with which I am acquainted: when of full growth and mature, they are always fertile. In many specimens, the frond is much more divided than the one which I have selected for my figure and description; and in such instances the veins and clusters of capsules partake of the subdivision. It should also be observed that the two lateral divisions of the fronds may, without impropriety, be termed the first pair of pinnæ, in which case their divisions would be pinnules, and not pinnæ, as I have here denominated them, from a desire to avoid a confusion of terms.

In the cut at page 57, figure *a* represents a portion of the creeping rhizome with three unexpanded fronds: figure *b* an expanded frond in a mature and abundantly fruited state (when sparingly fruited the divisions are broader and shorter); figure *c* a pinnule showing the veins and the points of attachment of the capsules; and figure *d* another pinnule, with the clusters of capsules *in situ*.

Culture.

This is an extremely beautiful fern in cultivation, and flourishes on rock-work if supplied with a light and moist soil, which its stolon-like rhizomes can readily penetrate: this should be composed of bog-earth, leaf-mould and sand, without any admixture of loam. Exposure to the sun rapidly changes the colour of the leaves to a sickly yellow-green, and causes the divisions to assume a convolute form; but, if shaded by trees, which can readily be accomplished, a patch of the most exquisitely delicate and lovely green may be preserved throughout the summer months; for the production of young fronds continues up to the end of September. In flower-pots it is not so readily cultivated as in the open air: but still, where pure air is unattainable, as in our London gardens, it may be managed by paying attention to the composition of the soil and the supply of moisture.



SMITH'S FERN, (*natural size*).

Characters.

Genus.—GYMNOCARPIUM, (see page 49).

Species. — ROBERTIANUM. Rhizome creeping: stipes erect, fully as long as the frond, entirely covered, as well as the frond, with minute short-stalked glands, which give the plant a mealy appearance: frond oblong deltoid; the first or lowest pair of pinnæ are opposite, stipitate, and pinnate, the second pair

generally stipitate and pinnatifid; the remainder are sessile and pinnatifid: an obtuse angle is formed at the union of the first pair of pinnæ with the stipes and rachis; lateral veins in the ultimate divisions usually simple: clusters of capsules circular, forming a submarginal series: involucre generally wanting: colour dull green, somewhat glaucous.

Synonymes, Figures, &c.

Polypodium Dryopteris, *Bolt. Fil. Brit.* 53, 1; *Newm. F.* (*ed.* 1), p. 26; *Ledeb. Fl. Ross.* xiv. 509.

Polypodium Robertianum, *Hoffm. Deutschl. Fl.* ii. 10; *Koch, Syn.* (ed. 2), 974; *Fries, Summa*, 82; *Moore*, 55.

Polypodium calcareum, *Sm. Fl. Brit.* 1117, *E. F.* iv. 283, *E. B.* 1525; *Newm. F.* 131; *Franc.* 24; *Hook. and Arn.* 567; *Bab.* 409.

Lastrea calcarea, *Bory, Dict. Class. d'Hist. Nat.* ix. 232; *Newm. N. A.* 17.

Lastrea Robertiana, *Newm. F.* 13.

Gymnocarpium Robertianum, *Newm. Phyt.* iv. 371, *App.* xxiv.

We are indebted to Bolton for first noticing and describing this fern, which he treated as a variety of Polypodium Dryopteris. "I have observed," says this author, "a variety of this plant growing in White Scars, near Ingleton, and in the Peak of Derbyshire, wherein the rib is taller, more firm, hard and robust, white and opaque; the leaves larger, the number of parts greater, and the largest of the lobes are again partly lobed, or divided down half-way to the middle rib: this variety I have figured, tab. 1, fig. 1." The plant, however, was first named and characterized as a species by Hoffman, who describes it in these words: — "Polypodium Robertianum. Fronde triangulari, foliolis ternis bipinnatis; pinnis pinnulisque inferne pinnatifidis. Stipes glaucus, uno latere sulcatus. Frons tenera. *Uterque nudo oculo subtili tomento, ad lentem brevissimis glandulis obsitis.* Odor debilis Geranii Robertiani. Fructif. minuta." — Hoffm. Deutschl. Fl. ii. 10, date 1795. Sir J. E. Smith, in 1804, redescribed the species under the name of Polypodium calcareum; see Flor. Brit. p. 1117. His subsequent

description in the 'English Flora' is in these words:—"Frond three-branched; branches doubly pinnate, erect, rather rigid; segments obtuse, somewhat crenate. Masses of capsules crowded, finally confluent. * * * Root creeping, but stouter and less extended than in the preceding species (*P. Dryopteris*). Frond more firm and rigid: its stalk more scaly about the lower part. All the three branches upright, smaller than the last, rigid, and not loosely spreading. Masses of capsules more crowded, finally in some degree confluent, and of a browner hue." Our British authors, Hooker and Babington, admit it as a species; the latter gives the following description, which, it may be observed, comprises diagnostics of more value than any pointed out by Bolton or Smith, although so admirably given by Hoffmann. "Fronds subternate, *glandular-mealy*, lower branches pinnate; pinnæ pinnatifid, obtuse, the uppermost nearly entire; sori marginal. Very different in habit from the preceding (*P. Dryopteris*), and always covered with very minute stalked glands, giving a mealy character to the surface. Frond not so decidedly trifid, the lower branches being much smaller in proportion to the middle one; all the three erect, rigid." Mr. Wilson, whose authority in British ferns is certainly inferior to no one's, also considers the present species distinct from G. Dryopteris, "I consider these plants," says Mr. Wilson, "to be quite distinct, the former [G. Robertianum] having truly the erect habit which Smith describes; I believe also that the pubescence is constantly present in P. calcareum. The two species are generally found in different habitats, but in a wood on the side of Ingleborough, as you go to Weathercote, they are found in company. I have cultivated them side by side for many years, with their respective characters unchanged." Mrs. Riley, of Papplewick, near Nottingham, has written a few lines on the same subject, which I shall take the liberty of quoting. "The pubescence, which is one distinguishing character of P. calcareum, is a beautiful microscopic object, each slender stem supporting a globular head, but this pubescence soon dries, so that only on freshly gathered specimens can it be fully perceived or accurately examined. Though we found P. Dryopteris frequently in Wales, we never met with P. calcareum there; and although, like Mr. Wilson, we have cultivated them side by side for years, we can also testify that

their respective characters remain unchanged." In letters from the Rev. Mr. Bree, and the late Mr. Cameron of Birmingham, opinions very similar to those now quoted are expressed, both these excellent botanists regarding G. Robertianum as a truly distinct species. It must however be observed that Sadler, in his treatise on the ferns of Hungary, admits this species with doubt, while the learned authors of the 'Flore Française' ignore it altogether, although of common occurrence in France; and Ledebour, in his 'Flora Rossica,' although well acquainted with it, advisedly unites it with Dryopteris. Originally I entertained a similar opinion, an opinion which careful observation of the plant under cultivation has induced me to abandon.

With regard to the specific name, I seem to have no choice but to adopt the earlier one, although our most distinguished English botanists, Hooker, Watson, and Babington, have advisedly selected the later. For every change of specific name, some sufficient reason ought to be assigned; yet neither Sir J. E. Smith, Sir W. J. Hooker, Mr. Watson, nor Mr. Babington, has given the least explanation of the change, although no one will presume to suppose either of these truly illustrious authors ignorant of Hoffmann's prior description.

My friend, Bory de St. Vincent, made this species a Lastrea in 1824, an arrangement which I adopted in 1844; but, not satisfied of its affinity with Bory's type-species, Oreopteris, I have ventured to place it under my new genus, Gymnocarpium, as already explained.

The figure of Dryopteris Tragi in Gerarde (Em. 1135), copied and reversed by the author of the 'British Herbal' (p. 48), without any acknowledgment, admirably represents this species, but there is nothing, either in the original or quoted description, that applies exclusively to Robertianum; on the contrary, it is most manifest that Dryopteris is also included: the information that "it is oftentimes found in sunny places;" that it grows "upon heaps of rubbish," &c., mingled, as it is, with much irrelevant matter, indicates the fusion of this species with the more common Dryopteris. There is a tolerably characteristic figure in Bolton's 'Filices' (tab. 1, fig. 1) under the name of Polypodium Dryopteris, and also in 'English Botany' (1525), the latter under the name of P. calcareum; but the very elegant

and pictorial representation in Francis's 'Analysis' (pl. 1, fig. 5), is certainly drawn from Dryopteris.

Geographical Range.

Our acquisition of precise knowledge of the geographical range of this species is greatly retarded by the incapacity or disinclination of botanists to distinguish between Gymnocarpium Dryopteris and G. Robertianum. Sadler gives it as a native of Hungary, Germany and France. Through the kindness of Mr. Allcard, I possess fronds from several localities in Switzerland; and Godet says that it is abundant on old walls and bare rocks in the Jura, especially in the mountainous regions. I have little doubt of its being generally scattered over the continents of Europe and America: I possess a specimen from the United States.

In Great Britain this fern seems confined to the limestone districts, making itself particularly at home amidst the débris of limestone quarries. Its distribution I should describe as geological rather than geographical, and quite independent of latitudinal or altitudinal conditions.

In the North of England it has been found in Durham, and occurs abundantly in Cumberland, Westmoreland, Yorkshire, and Lancashire. In Derbyshire, I am informed by the Rev. Mr. Pinder that it occurs plentifully at Matlock, and by Dr. Wood near Buxton: many other botanists confirm these localities. A cluster of counties further South, — Oxfordshire, Wiltshire, Gloucestershire, and Somersetshire, — also produce this species; Oxfordshire and Wiltshire somewhat sparingly, the others abundantly: my nephew, Henry Newman, has obligingly given me specimens from five different stations near the town of Cirencester, and the Cotteswold Hills, in the same district, have a great number of localities recorded on the best authorities.

Wales.—From the Welch localities I incline to omit that of Cwm Idwell, in Caernarvonshire; while that of Llanferris, in Denbighshire, on the authority of Miss Potts, and from which, through the kindness of Mr. Kippist, I possess specimens, and that of Merthyr Tydfil, on the authority of Mr. Babington, must be retained.

Scotland and Ireland have hitherto furnished no localities.

Description.

The radicles are fibrous: the rhizome is dark brown and creeping. The fronds make their appearance in May, and

both their habit and mode of unfolding differ from those of G. Dryopteris; the three portions of the frond never assume the appearance of three little balls, which I have mentioned as an excellent diagnostic of G. Dryopteris, but all the pinnules appear somewhat globular, the first pair of pinnæ differing from

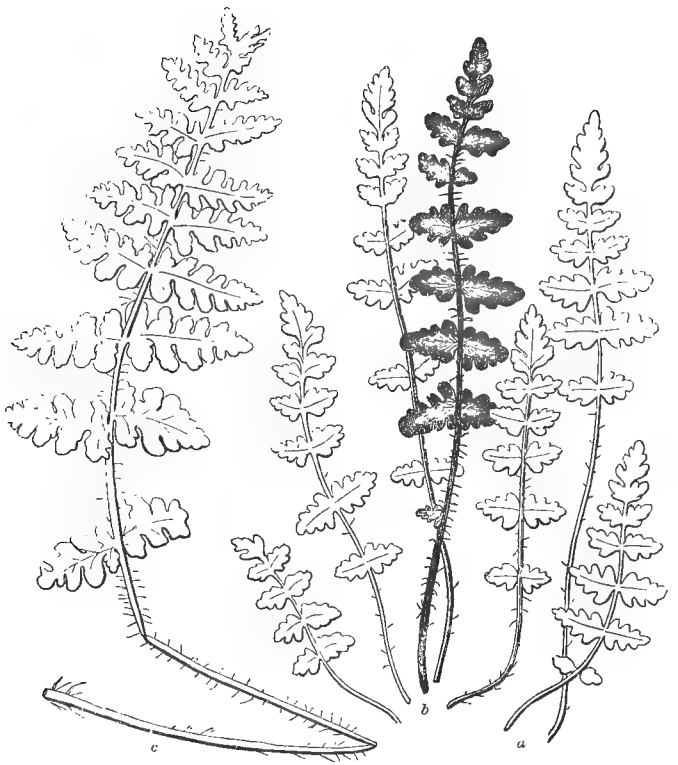
the second in little else than magnitude. In the figure at page 68, I have taken great pains to give a faithful representation of some young fronds: I divided the stipes of each, on account of its inconvenient length, and laying them on the block before me, made an accurate copy, both as regards size and figure. The stipes is much stouter and more succulent than that of G. Dryopteris, and I think also more scaly; it is of the same dull green as the frond, whereas the stipes of G. Dryopteris is frequently purple or blackish, and has a more wiry appearance. The frond attains its full development in July, and matures its seed in August. The form of the expanded frond is nearly triangular, the base being shorter than the sides, and altogether not unlike that of the common brakes: the pinnæ are opposite; the first pair always have a short naked stalk; the second pair frequently have a similar stalk, but not invariably, and the naked stalk of the first pair of pinnæ is always shorter and rather more slender than the main rachis between the first and second pair, whereas in G. Dryopteris the three are of nearly equal length and thickness: the pinnæ are pinnate, the pinnules deeply pinnatifid: all parts of the frond are covered with the "subtile tomentum" described by Hoffmann: this consists of a number of minute stalked glands. The bend, so observable in G. Dryopteris at the point of union of its three branches, is much less marked in G. Robertianum. The lateral veins of the lobes of the pinnules are undivided, and the capsules are borne in circular clusters near the termination of each, as in both the preceding species. These clusters become confluent in the autumn, and form a continuous marginal series.

I have made this description comparative rather than positive, on account of the confusion which has long subsisted between two closely allied species.

Culture.

This fern grows freely in the ordinary soil of gardens, but seems peculiarly to enjoy a plentiful admixture of limestone broken small: it suffers no injury from full exposure to the sun. When cultivated in the greenhouse, it should be planted

in a large pan, containing a mixture of small pieces of limestone, crumbled and sifted mortar from old walls, and free crumbling loam: the pan being partially filled with this mixture, the rhizomes should be carefully arranged on its surface, and these again covered with the mixture to the depth of an inch: the pan thus prepared should be placed in the most airy and exposed part of the greenhouse, and no shelter of any kind placed over or around the fern.



RAY'S WOODSIA, (*natural size*).

Characters.

Genus.—Woodsia. Caudex tufted, terminating in a crown: midvein of ultimate divisions indistinct: lateral veins branched, free: involucre seated near the extremity of each branch, its base inclosing the base of a circular cluster of capsules, its margin split into capillary segments, which mingle with the capsules.

Species.—Ilvensis. Stipes sometimes as long as the frond, but generally shorter, distinctly articulated towards the base: frond lanceolate, pinnate: pinnæ oblong, subopposite, pinnatifid, scaly beneath.

Synonymes, Figures, &c.

Acrostichum Ilvense, *Huds. Fl. Ang.* 451; *Bolt. Fil. Brit.* 14, t. 9.

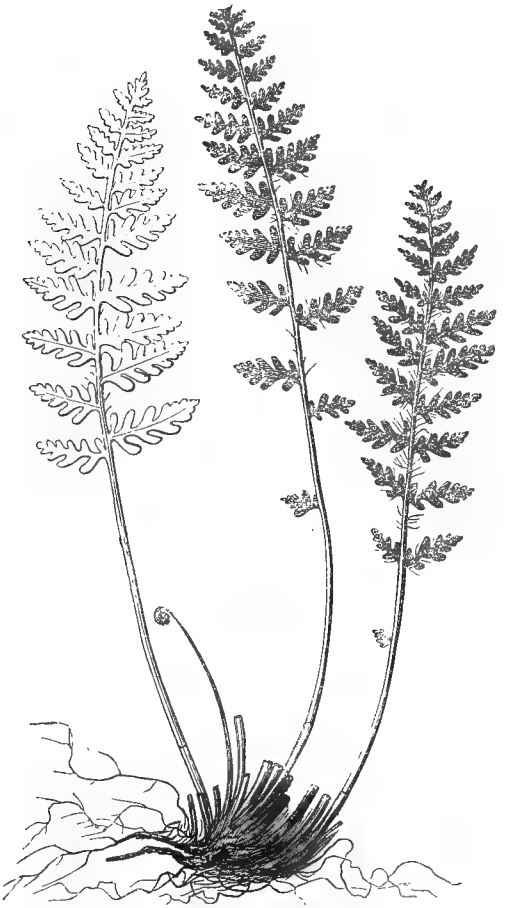
Polypodium arvonicum, *With. Arr.* 774.

Woodsia Ilvensis, *R. Br. Trans. Linn. Soc.* xi. 173; *Sm. E. F.* iv. 322, *E. B. S.* 2616; *Newm. N. A.* 13, *F.* 137; *Hook. and Arn.* 567; *Bab.* 409, ad partem.

Woodsia Raiana, *Newm. F.* 140, a name suggested in 1844.

The figures of this fern in Bolton's 'Filices' (tab. 9), 'English Botany' (Suppl. 2616), and Francis's 'Analysis' (pl. i. f. 6 A), give but a very imperfect idea of the plant; the latter is particularly unlike. Of the continental figures I entertain so much doubt as to their representing our British plant, that I forbear quoting them. The doubt, of course, is equally applicable to nomenclature, and I name the species as Woodsia Ilvensis of our British authors, without attempting to prove it the Acrostichum Ilvense of Linneus. I have no doubt that it is the "Filix alpina, Pedicularis rubræ foliis subtus villosis" of Ray, although this description is referred by Sir J. E. Smith to the plant I have next described. I am extremely gratified to find that Mr. Wilson entertains a similar opinion. In a letter received from that gentleman, he says, "I cannot help thinking that the synonym in Ray's 'Synopsis,' usually applied to the other species, belongs to this fern, notwithstanding that in the locality pointed out by Ray, on Snowdon, I find only W. hyperborea, which I have never seen there 'foliis sex circiter digitis longis,' and which less resembles Pedicularis." Ray's description appears to me to lay stress upon all the points in which the present plant chiefly differs from the next. There can be scarcely a doubt that the plant now under consideration is the Polypodium arvonicum of Withering, whose description —"Leafits spear-shaped, wing-cleft, hairy underneath; stem hairy" (Arr. iii. 774),—is peculiarly apt. I am indebted to the kindness of Dr. Robert Brown, for specimens gathered by himself in the North of Europe, of the true Acrostichum Ilvense of Linneus, one of which is figured on the opposite page; and these, while agreeing exactly with the authentic Linnean specimen in the herbarium of the Linnean Society, differ so

much from the British plant, that I hesitate to pronounce them identical. Should the British plant prove distinct, I beg to propose that it should bear the name of Woodsia Raiana. The doubt as to this species being distinct from W. alpina (W. hyperborea of Smith), will again be noticed under my description of that species.



With regard to the genus to which these little plants are referrible, considerable difference of opinion appears to prevail. Linneus, Bolton, Liljeblad, and Hudson, place them in the

genus Acrostichum: Withering, Sowerby, Willdenow, Sprengel, Schkuhr, Wahlenberg, and Presl, in the genus Polypodium: Lamarck and Decandolle in the genus Ceterach: Smith, Hooker, Sadler, and Babington, in the genus Woodsia, instituted by Dr. Robert Brown purposely to receive them: my own judgment, if deduced from an inspection of the plants only, and without reference to books, would lead me to unite the genera Woodsia and Cystopteris. The description of this genus was published in the eleventh volume of the Linnean 'Transactions,' and its distinguishing character consists in the peculiar structure of the involucre, which is inserted under the cluster of capsules, the attachment of which it surrounds, while its margin, as in the linear involucre of Pteris, already described, is split into a number of articulated capillary segments, which intermingle with the capsules and partially conceal them.

Geographical Range.

The geographical range of Woodsia Ilvensis is somewhat extensive. It is of common occurrence in Norway, Lapland, Sweden, and Northern Russia: it occurs, but less frequently, in Denmark, Germany, Hungary, France, Italy, and Spain, and extends throughout Siberia into Kamtchatka: it is also recorded as a native of North America. But in the whole of these instances I can only speak as to the record of the name; I will not venture to assert that the British plant is thus widely distributed.

In Britain this is one of the rarest of our ferns: it roots in the fissures of rocks in the most bleak and exposed mountainous regions: it has hitherto occurred to botanists in two counties in England, one in Wales, and probably three or four in Scotland: but this excessive rarity is perhaps partly ideal, as every year seems to extend the number of ascertained localities.

Forfarshire.—I am indebted to Dr. Greville for a specimen from the Clova mountains; and the very fine specimen represented at fig. *c* (page 71), was gathered in August, 1836, in Glen Fiadh, by Mr. Wilson, who most obligingly favoured me with the drawing, of which that figure is a *fac simile* copy. Mr. Tatham, of Settle, the Messrs. Backhouse, Mr. Westcombe, and several other botanists, have observed it in the same glen.

Dumfriesshire and Peeblesshire.—The chief station in the United Kingdom for Woodsia Ilvensis appears to be the vicinity of Moffat and Kirkpatrick, near the northern boundary of the county of Dumfries. The first notice is from Mr. William Stevens, under date of December, 1848; it was published in the January number of the 'Phytologist' for 1849, and is as follows:—"Woodsia Ilvensis: this rare and handsome little fern I found in considerable abundance, on very steep crumbling rocks, amongst the hills dividing the counties of Dumfries and Peebles, in July last. It is growing in dense tufts in the crevices of the rocks, and very luxuriant, many of the fronds measuring nearly six inches in length."—Phytol. iii. 392. My next information is from the Rev. William Little, who says "it is found in several stations on the Moffat Hills: one of these stations is on the farm of Corehead, about four miles north of the town of Moffat. The plant here grows upon exposed rocks, its roots often wedged in their crevices, so as to render it difficult, and in some cases impossible, to extricate them. Another locality is about six miles east of this, in a ravine near Loch Skene. Here the fern grows among crumbling rocks, and often spreads its roots under loose stones. In this station it attains a much larger size than in the former. The altitude of the former locality is about 1,200 feet, of the latter, 2,000." My third correspondent on this subject is Mr. Johnstone, of Catlins, near Dumfries, who writes thus:—"In the autumn of 1850, while botanizing over the mountains bordering Dumfriesshire and Selkirkshire, with a description of the habitat furnished by a friend, who had previously seen it, I succeeded in finding the Woodsias in a beautiful little glen, of very brittle clay-slate formation, scattered over with birch and mountain ash, and having a little mountain rivulet running through it. At one part the glen turns, making an obtuse angle, and the Woodsias are only to be found on the right hand side, and do not pass the angle; they grow over a space of about two hundred yards, beginning at a foot from the ground, and ascending the almost perpendicular rocks to the height of thirty feet. Pursuing the same route in 1851, I had the pleasure of discovering another station, some miles distant, in the same formation, and having the same aspect, the only noticeable differences being that the second glen is wider and longer, with more soil on the rocks, and that consequently the plants are much more luxuriant in their growth, the fronds being six and seven inches long."

Durham.—Mr. Winch, in his 'Flora of Northumberland and Durham,' gives these localities:—"Near the summit of some bold basaltic rocks, called Falcon Clints, about ten miles west of Middleton, in Teesdale, *Mr. S. Halestone.* At the foot of basaltic rocks, on the Durham side of the river Tees, about two hundred yards below Cauldron Snout, *Mr. J. Backhouse.*" Mr. Winch observes that these localities must be near together. Mr. Simpson observed the plant there in 1838, and has kindly presented

me with a frond. "Recrossing the bridge," says that gentleman, "we pursued the course of the stream, which, almost immediately below the Snout, takes a sudden turn, and thus we found our track hemmed in by the over-laden Tees on our right hand, and the lofty basaltic rocks called Falcon Clints on our left. My eye was now anxiously directed to the face of these rocks, to discover, if possible, the chief object in taking our present course—Woodsia Ilvensis. Rain now began to fall heavily, and the wind, which had been all day very tempestuous, bore it against us so as to render observation, either of locality or objects, very imperfect. However, after tracing, as near as I can judge, about four hundred yards, I espied some small specks of green through the broken fragments of a stream which poured over the Clints, and under which I soon stood, pulling hastily the patches I had seen, and these, to my delight, proved to be two small plants of the Woodsia, mixed with a few fronds of Asplenium viride and Cystopteris fragilis." Mr. King found several specimens in 1841. "Here," says Mr. King, "I cast around many an anxious look for Woodsia Ilvensis; at length, after much searching, and a good wetting from the drip of the water from the huge basaltic rocks, to my great joy I espied two small plants, which were instantly secured: a little farther on we saw three more under a bush of Prunus Padus, but, not liking to destroy the plant, we left the roots of these in the crevice of the rock where they were growing." Mr. J. Backhouse, jun., Mr. Babington, Mr. Borrer, and other botanists, have repeatedly verified this Falcon Clints station; and I have to acknowledge my thanks to these botanists for the opportunity of examining and comparing specimens, and to Mr. Kippist for a specimen gathered in the same locality by Mr. Woods: the five fronds represented at *b*, in the cut at page 71, are from this station, (see Phytol. i. 74 and 114).

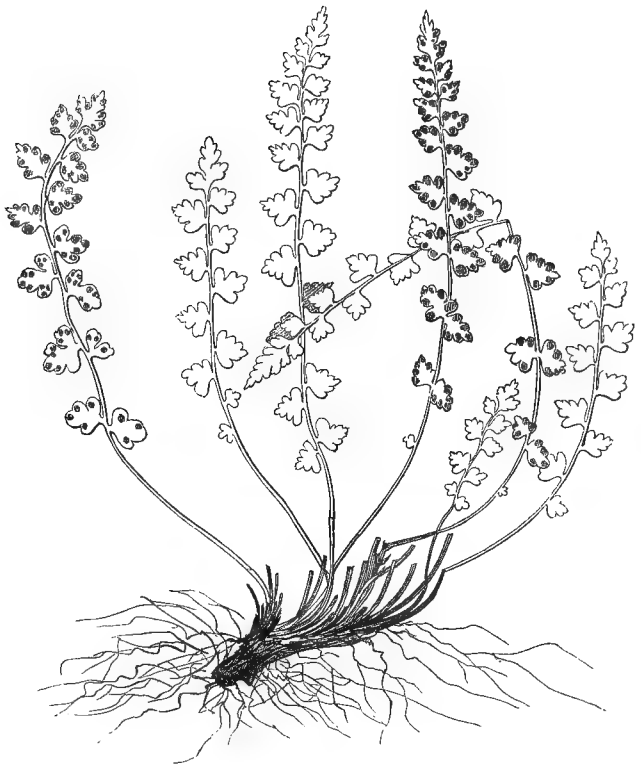
Westmoreland.—The following interesting note appeared in the 'Phytologist' for October, 1842. "On the 17th of 8th month [August], 1798, my father gathered a single frond of a fern from Crosby-Ravensworth Church, Westmoreland. Being unable to name it, he showed it to several botanists in London, who could not decide what it was; Lewis Dillwyn at length sent it to Sir J. E. Smith, who returned the specimen labelled as follows:—'Polypodium arvonicum, *With. et Fl. Brit. J. E. Smith.* P. ilvense, *With. &* Acrost. ilvense, *Huds.* (not Linn.) Acr. alpinum, *Bolt.*' The original specimen is now in my possession, with Sir J. E. Smith's autograph; the frond is 3¼ inches in length, from the bottom of the rachis to the apex, and about 2 inches from the lowest pinnæ to the apex. The church has been pulled down within the last few years."—Silvanus Thompson, in Phytol. i. 331. I have not seen this specimen, and therefore entertain a doubt whether it belong to this species or the next. "A new station for Woodsia Ilvensis has been found in Westmoreland. As it is many miles from the Teesdale habitat, I consider it an interesting and important

discovery. It was found by Isaac Hudhart, a gardener, who has studied the ferns, and has been very successful in finding all the best ferns of the district. He has wisely told no one about the locality of the Woodsia but myself; for I consider it absolutely necessary to keep secure the habitats of good ferns now, as, if known, they are sure to be exterminated. There may be about twenty plants." — Mr. F. Clowes, in Phytol. iv. 1134. I am indebted to Mr. Clowes for a frond from this locality, and find it correctly named.

Caernarvonshire. — Mr. Wilson found this fern near Llyn-y-cwn, on Glyder Vawr, in 1824; and it has since been seen by Mr. Roberts, of Bangor, and I believe several other botanists, directed to the spot by Mr. Wilson. I am indebted to the kindness of Mr. Wilson and Mr. Pamplin, for specimens from the Llyn-y-cwn locality; the two fronds represented at *a*, on page 71, are from this station. Dr. Allchin informs me that he found this species near Llyn-y-cwn in 1851; and I am also informed by another botanist that he has found it "above" Llyn-y-cwn. My correspondent says that "as many as a hundred plants are visible, fortunately, however, nearly the whole of them are inaccessible, and cannot possibly be obtained without the assistance of a ladder." — Phytol. iii. 739. When I received this information I quite supposed the station the same as Mr. Wilson's, but now I think otherwise, for the plant has since been found in two stations, one above, the other below, Llyn-y-cwn. Mr. Latimer Clark discovered a third station, "on rocks of a peculiar character, resembling limestone, which crop out on the Glyder or left hand side of the Pass of Llanberis, looking towards Capel Curig: there may be a dozen small plants scattered over the rock, which is barren, arid, and exposed, and the plant seems dwindling to extinction." William Williams, an active and intelligent Snowdon guide, is but too well acquainted with the Snowdonian stations of both the Woodsias: I don't think he would willingly exterminate them, but he is subject to such constant solicitations from botanical tourists to be conducted to the localities, that the utter extermination of these ferns from all accessible places is not only certain, but also imminent. A passage from Ray's 'Synopsis' should be quoted here, since it goes far to show that both this species and the next have been found on Clogwyn-y-Garnedh; the comparison of the leaves with those of Pedicularis seems to agree with the present species. "Filicula Alpina Pedicularis rubris foliis subtus villosis. *Small Stone Fern with Red-rattle leaves hairy underneath.* Nusquam vidimus quam in udis scopulis *Clogwyn y Garnedh* dictis juxta summitatem montis Gwydhvæ totius Cambriæ altissimi. *D. Lloyd.* E petrarum rimis emergit, non erecta sed aliquantulum procumbens Ceterach aut Trichomanis ad instar, foliis sex circiter digitos longis. It's a very rare plant even at Snowdon."—Syn. p. 27.

Description.

The radicles are black, wiry, and sparingly branched: the caudex is thick, tufted, and lasting many years: the stipes is very distinctly jointed at a distance of three quarters of an inch from its junction with the caudex; the articulation is swollen, and very obvious to the naked eye when the frond is mature; at this point, so far as my observation has extended, separation generally takes place, the basal portion of each stipes adhering to the caudex. This very interesting character, common to all plants of the genus, is well described by Wahlenberg (Fl. Lapp.) The stipes, above this joint, as well as the rachis, is clothed with lanceolate scales, and glittering articulated hairs. Mr. Wollaston, whose valuable observations on the British ferns under cultivation are interspersed throughout this little monograph, informs me that the vernation of this fern usually begins about the middle of March; it then throws up a tuft of elongated "shepherd's-crook-formed" fronds, which are densely covered beneath with light-coloured, chaffy, and hairy scales, and which exhibit no appearance whatever of fructification, even until they have attained a considerable degree of maturity. The form of the frond is lanceolate and pinnate: the pinnæ are in pairs and generally opposite at the base of the frond, but becoming alternate towards the apex; they are sessile, oblong, obtuse, deeply lobed, and in some specimens pinnatifid, in which case the lobes are crenate, as in figure *c*, (page 71): the upper surface of the frond appears smooth to the naked eye, but under a lens of high power, a few long bristle-like scales are observable, all of them pointing outwards; the under surface appears pubescent, and, with the aid of a lens, this pubescence is found to consist, *first*, of very long, pointed, narrow scales, which are more particularly abundant about the midrib; *secondly*, of glittering and articulated hairs, which are scattered over nearly the entire surface; and, *thirdly*, of the capillary segments of the involucres, which are also glittering and articulated. The capsules are placed in circular clusters near the margins of the lobes or pinnules; they are frequently concealed by the pubescence already described.



BOLTON'S WOODSIA, (*natural size*).

Characters.

Genus.—Woodsia, (see page 71).

Species. — Alpina. Caudex tufted: stipes shorter than the frond, articulated near its base: frond narrow-linear, pinnate: pinnæ alternate, deltoid, obtuse, lobed.

Synonymes, Figures, &c.

Polypodium fontanum, *Herb. Linn.*

Acrostichum Ilvense, *With. Arr.* 649.

Acrostichum alpinum, *Bolt. Fil. Brit.* 76, t. 42.
Acrostichum hyperboreum, *Liljeblad, St. Tr.* 201, t. 8.
Woodsia hyperborea, *R. Br. Tr. Linn. Soc.* xi. 173; *Sm. E. F.* iv. 323, ? *E. B.* 2023; *Hook. and Arn.* 567.
Woodsia alpina, *Newm. N. A.* 13, *F.* 143, *Phyt. App.* xxvii.

This little fern is excellently represented by Bolton, whose figure is so like my own that I thought it quite unnecessary to copy it, otherwise I should have done so, with a view of confirming the specific name; also by Bauer (in illustration of Dr. Robert Brown's paper in the Linnean 'Transactions'), and by several continental authors.

With regard to the specific name, I have proposed a change which may, at first sight, appear to be somewhat capricious, but which, when investigated, will, I trust, be found in accordance with the received principles of botanical nomenclature. The specific name of "hyperborea" has been applied to this plant by Liljeblad, Swartz, Willdenow, Brown, Wahlenberg, Smith, Hooker, and many other botanists; indeed, it seems so sanctioned by authority, that it is not without great reluctance that I venture on the alteration which I will now attempt to justify. The first description of this fern that I can find is that in Bolton's 'Filices;' it is under the name of Acrostichum alpinum, and is as follows: — "The root of this little Acrostichum consists of a few black, hard branches, connected to a small head, and furnished with black, hard, capillary fibres. The rib of the first leaf, when full grown, is about three inches high, of a pale brownish green colour, slender, and smooth, being quite destitute of hairs. Second leaves six or seven pairs, opposite below, alternate above, of a triangular figure, obtuse at the corners of three or four of the lower pairs, but all of equal size and remote, two or three of the upper gradually lessening and growing closer together. Lobes of the second leaves most commonly five, two on each side of the rib and one at the end; they are of a roundish figure, grow close together, and are obscurely crenated round the margin. The colour on the upper side is a brownish kind of green; the under side thickly covered with a brown hairy nap. The lower figure represents one of the second leaves as it appeared when a little magnified: the seed-vessels are disposed in three or four clusters on each lobe, partly hidden among the numerous strong brown hairy filaments,

by which also the whole under side of the leaf, quite to the margin, is thickly covered. The specimen above described is very exactly figured on plate 42, and is a plant so perfectly distinct from the Acrostichum Ilvense, in its usual state, that it seems to me unreasonable to suppose them both of the same species. The Acrostichum Ilvense, described in the former part of this work (page 14), and accurately figured on plate 9, was brought from Snowdon. Oeder, in 'Flora Danica,' has given an excellent figure of the same plant (tab. 391), and the figure in Pluk. Phyt. tab. 179, fig. 4 (which is cited by Linneus in Flo. Suecica, ed. 2, No. 938), agrees pretty aptly with both Oeder's and my own. But all are very different from the Acrostichum alpinum above described. The specimen figured on plate 42 was brought from Scotland, but the plant is also a native of South Britain, for in a volume of dried plants, collected by the late Mr. Knowlton, I have seen specimens of the same plant with this note in his own handwriting: — 'From the mountains of Wales.' From these and some other circumstances I am induced to think that two species of British ferns have been confounded together under the name of Acrostichum Ilvense, and I believe that future observation will confirm the truth now discovered."

I have quoted the description entire, in order to remove any doubt as to the plant now under consideration being identical with that described by Bolton, although the testimony of Brown and Smith, who cite Bolton's name as a synonyme, might perhaps be deemed sufficient to decide this branch of the inquiry. We then arrive at the question of date. Bolton's work on the British ferns, although paged continuously, was published in two parts, the first at Leeds, in 1785, the second at Huddersfield, in 1790; Acrostichum alpinum occurs in the second part. The name of Acrostichum hyperboreum was published by Liljeblad in the Stockholm 'Transactions' for 1793, and is the authority quoted by Smith and others. Liljeblad's description may possibly be dated one year earlier: but admitting this, we must still give Bolton a priority of two years, quite sufficient to decide a question of nomenclature: yet it is somewhat remarkable that Lamarck and Decandolle are the only authors who have adopted the specific name of alpinum.

Geographical Range.

On the continent of Europe this fern has been observed in Norway, Lapland, Sweden, European and Asiatic Russia, Germany, Hungary, Switzerland, France and Spain. I am not aware of its occurrence in Africa, but in North America a closely approximate species has been found on the Rocky Mountains, which is, however, considered distinct by Dr. Robert Brown, who has described it under the name of Woodsia glabella.

In Great Britain its ascertained range seems restricted to two Scotch and one Welch county.

Perthshire.—According to Smith and other authorities, Mr. Dickson, Mr. G. Don, and the Rev. Dr. Stuart, found this plant on Ben Lawers. Mr. Wilson informs me that he found it on Ben Lawers, Mael-dun-Crosk, Craig-Challiach, and other mountains, in 1827, and again on Ben Lawers in 1836: Dr. Balfour found it again on Ben Lawers in 1847, (Phytol. iii. 81); Mr. Watson gives me Craig-Challiach, on the authority of Mr. Maughan; and, lastly, Mr. Johnstone informs me that he has beautiful specimens gathered in August, 1853, on Ben Lawers, in the parish of Kenmare.

Forfarshire.—Dr. Balfour gathered this little fern in Glen Fiadh in 1847, (Phytol. iii. 81).

Dumfriesshire? — The Rev. Mr. Little thinks that Woodsia alpina does not grow on the Moffat Hills; Mr. Johnstone, on the contrary, thinks the form so designated does grow in that locality, and has obligingly sent me a frond which certainly goes far to corroborate this opinion: but then, he also expresses a doubt as to the distinctness of the two. His remarks on this subject are as follow: — "You inquire whether both species of Woodsia grow at the station on the Moffat Hills. I may answer that the only differences that I can see between the supposed species, are that the pinnæ of alpina are a little more rounded than those of Ilvensis *usually* are, and that the stipes of Ilvensis is of a reddish brown colour, while that of alpina is greener: in all other respects they are alike. They have the same scattered roundish sori; the same hairy and chaffy stipes and rachis; and the same lanceolate and pinnate fronds. Can the slight differences I have noticed constitute a species? I think not. I have now before me more than fifty fronds, and no two of them are alike. I think that alpina may, with all safety, be set down as a variety of Ilvensis, and not a very marked one. I have cultivated them for some years, and find them retain their pecu-

liarities. The glens in which the Woodsias occur run exactly North and South, and consequently face East and West; the Woodsias almost invariably occur with a West exposure." I must also add, in contravention of Mr. Johnstone's opinion, a remark of Mr. Wollaston, which is verified by the observation of Mr. Backhouse, jun., that Woodsia Ilvensis occasionally produces fronds like those of W. alpina; and therefore, the fact that such fronds occur on the Moffat Hills, does not necessarily prove the identity of the two species.

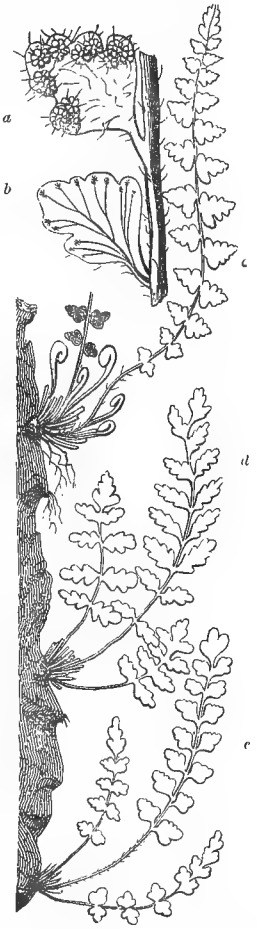
Caernarvonshire.—This fern was found by Mr. Wilson on Clogwyn-y-Garnedh, one of the precipices of Snowdon which faces the East, as observed by that botanist, on whose authority Smith corrected a supposed error of Ray and others, who describe the precipice as facing the North-west. Mr. Wilson's habitat, as well as the aspect of that habitat, is abundantly confirmed below; but another botanist, who wishes to remain anonymous, confirms Ray's description as well. He says, "You are wrong in accepting Wilson's alteration of the aspect of Ray's habitat. Woodsia grows abundantly on these precipices, facing both the East and the North-west; the name of Clogwyn-y-Garnedh applies equally to both aspects, and as to the species, I cannot say which: are there really two?" I should not quote a writer who chooses to remain anonymous, but that I feel a real pleasure in confirming any statement of our immortal Ray, and I know that my correspondent's statement is to be relied on. Mr. Latimer Clark, whose engagements in connexion with the building of the tubular bridge over the Menai detained him for months in the Snowdon district, found this fern in two localities. He says, "Woodsia alpina grows in that vast chasm called Clogwyn-y-Garnedh, which forms the eastern precipice of Snowdon. It occurs on some almost inaccessible rocks facing the East, above the lake called Glas Llyn: the rock is of a peculiar character, unlike other rocks in the neighbourhood, and resembles limestone: the ledges on which the fern grows cannot be reached without great danger, and many of them are perfectly inaccessible, so that there is no danger of its eradication. The same rock crops out in the Pass of Llanberis, facing the North, on the Snowdon side of the Pass, and here it is again accompanied by Woodsia alpina, but most of the ledges where it grows are of an equally unapproachable character." In August, 1853, Mr George Maw visited this Llanberis Pass locality, and brought away some very beautiful specimens, which he has most kindly shown me: the rock on which they occur is called Moel Sichog; it is on the right or Snowdon side of the Pass, going from Llanberis towards Capel Cerig.

I cannot conclude this notice of habitats without expressing my warmest thanks to the gentlemen who have so kindly and readily responded to all my inquiries.

Description.

After so ample a description as that already quoted from Bolton, it may perhaps be thought unnecessary to give one of my own; but I scarcely think myself justified in such a departure from my usual course as to omit it. The radicles are black, wiry, and branched: the caudex is tufted, large in proportion to the entire plant, and apparently very enduring. In its vernation this species, as Mr. Wollaston informs me, differs essentially from Woodsia Ilvensis: it forms a crest of simply circinate fronds, much more thinly clothed than Ilvensis with buff-coloured scales, and its clusters of capsules are very conspicuous, even in its youngest state, and immediately it begins to unfold: unlike those of Ilvensis, its fronds are almost persistent, the plant appearing to be scarcely ever in a state of perfect rest. The stipes is slender, and nearly smooth; it has a few small, scattered, and pointed scales, and some very slender articulated hairs, amounting in a very young state to a fine pubescence, but both these appear to be easily removed, since in nearly all the mature dried specimens I have seen, they were entirely wanting: the stipes is articulated, like that of the preceding species; and I have a specimen which has two articulations, a circumstance which I imagine is of unusual occurrence. The shape of the frond is long, narrow, linear, and pinnate: the pinnæ are perfectly separate, sometimes distant, almost invariably alternate, and in shape somewhat triangular, the angles being rounded; they are lobed; the lobes are five or seven in number, and very obtuse; the first superior lobe is sometimes considerably larger than the rest, and slightly notched; the apex of the frond is pinnatifid and pointed: the margins and under surface of the pinnæ are sparingly furnished with articulated hairs. The venation is rather anomalous: no particular vein appears to possess a very decided superiority over the others; they are occasionally simple, but generally divided into two or three branches; they do not quite reach the margin of the pinna, and the clusters of capsules, when present, are placed at their extremity: figure *a* in the cut on the opposite page represents a pinna of this species, with the capsules *in situ*; figure *b* shows the venation, and the points of attachment of

the capsules after their removal. It may also be here observed, that figure *c* represents a somewhat intermediate form from Scotland; figure *d* another from Llyn-y-cwn, and, judging from the locality, probably referrible to W. Ilvensis; and figure *e*, a plant of the present species from Ben Lawers.



Concerning the distinctness of species so similar as this and the preceding, much difference of opinion must always prevail. It will be seen, by my quotation from Bolton, that that author strongly insists on maintaining them as species. Sir J. E. Smith also considers them distinct; in describing this species, he contrasts the characters of the two in these words:—"Rather smaller than the foregoing, and less [? more] upright, with a more [? less] rusty aspect. Stalk less elastic. Leaflets shorter, rounder, with more rounded lobes, and broader at the base, not quite so deeply pinnatifid. The two species appear to me to be very distinct, though similar." — Eng. Flora, iv. 323. Sadler gives them as distinct, without a comment, but does not appear to me to distinguish them very cleverly by his descriptions, ('De Filicibus Veris,' p. 45). Wahlenberg insists on their distinctness, drawing an elaborate contrast between them, (Fl. Lapp. 280). Lastly, Mr. Wilson remarks, "I have never had the least difficulty in distinguishing these plants, the first by its ovate, the second by its oblong, pinnæ," (Phytol. i. 74). All these are weighty authorities; but, on the other side, I find others equally entitled to respect. Dr. Robert Brown observes,—"These two plants are indeed so nearly related that I find myself unable to construct for them clear specific characters, and therefore, in proposing them here as distinct species, I am, from want of sufficient

materials to determine the question, rather following the prevailing opinion than my own." — Trans. Linn. Soc. ix. 172. Mr. Babington has treated them as forms of one species, and makes this observation : — " Our plants appear to form but one species, although they present three very different appearances." —' Manual,' 409.

Culture.

Both this fern and the preceding are comparatively easy of cultivation under glass, care being taken to avoid excessive heat: no sunshine whatever should be allowed to reach them, not so much from any ill effect to be apprehended from the direct rays of the sun, as from the excess of heat always produced in a glazed case from the shining of the sun thereon: sunshine, accompanied by the fresh mountain breeze, is perfectly innocuous. If potted, the pot should be first filled with thin pieces of stone, placed vertically ; basalt, commonly known as " dew stone " granite, freestone, and sandstone, have all been found to answer : after the stone has been arranged so as to surround the rim of the pot, the radicles of the fern should be carefully arranged between the central pieces, leaving the crown of the caudex just visible : then prepare a finely sifted mixture of thoroughly decayed leaf-mould, silver sand, and peat earth; introduce this in a nearly dry state, and gently shake it down amongst the stones, until all the interstices are filled : on watering the surface, this light mould will probably disappear ; it should be repeatedly filled up and watered, until the fragments of stone only crop out here and there above the surface of the pot. Mr. Wollaston slightly differs in his directions for cultivating these ferns, recommending the addition of loam, as more retentive of moisture.

The Rev. Mr. Little informs me that Woodsia Ilvensis grows freely with him in a cool greenhouse, and also under a frame, but that it thrives still more freely in the open air, in a shady corner of the garden. W. alpina is more difficult to cultivate : he has lost it several times. Mr. Little adds that the Moffat Hills are of the lower Silurian formation.

BRITTLE FERN, (*natural size*).

Characters.

Genus. — CYSTOPTERIS. Midvein of ultimate divisions distinct but sinuous : lateral veins branched, free : involucre attached almost beneath the mass of capsules, half way between the midvein and the extremity, directed at first backwards, then

upwards, then forwards, and almost covering the circular mass of young capsules like a hood, its anterior margin split into unequal and often capillary segments, like that of Woodsia.

Species. — Fragilis. Caudex elongated horizontally but very slowly, its elongation due solely to the development and decay of fronds, its growing extremity erect, crowned with undeveloped fronds: stipes shorter than the frond: frond erect, lanceolate, pinnate: pinnæ ascending, distinct, subopposite, pinnate: involucre generally present: seeds echinate: colour dull green.

Synonymes, Figures, &c.

Polypodium fragile, *Linn. Sp. Pl.* 1553; *Lightf. Fl. Scot.* 677; *Huds. Fl. Ang.* 459; *With. Arr.* 779.

Polipodium fragile, *Bolt. Fil. Brit.* 50, t. 27 & 46.

Polypodium rhæticum, *Huds. Fl. Ang.* 458; *With. Arr.* 780; *Bolt. Fil. Brit.* part ii. 80, t. 45, but certainly not of *Linn. Sp. Pl.* 1552, as cited by early English authors.

Polypodium polymorphum, *Villars, Dauph.* iii. 847.

Polypodium dentatum, *Dicks. Crypt.* fasc. iii. 1, t. 7, f. 1, *Id. H. Sicc.* fasc. 16; *With. Arr.* 776.

Polypodium trifidum, *With. Arr.* 779.

Cyathea fragilis, *Roth, Fl. Germ.* iii. 94.

Cystea fragilis, *Sm. E. F.* iv. 298, *E. B.* 1587.

Cystea dentata, *Sm. E. F.* iv. 300, *E. B.* 1588.

Cystea angustata, *Sm. E. F.* iv. 301.

Cystea regia, *Sm. E. F.* iv. 302, ad partem, *i. e.*, excluding the plant found on the garden-wall at Low Layton, which has not been gathered wild in Britain.

Cistopteris fragilis, *Mack. Fl. Hib.* 341.

Cystopteris fragilis, *Newm. N. A.* 15, *F.* 13, 149; *Hook. and Arn.* 572; *Bab.* 412.

Cystopteris dentata, *Bab.* 412, and *Moore*, 71, excluding Dickieanum, *Sim.*

There are many very beautiful and characteristic figures of this fern: those in Bolton's 'Filices,' under the names of Polypodium rhæticum and P. fragile (tab. 44—46), yield to none in excellence.

The little ferns constituting the present group, were comprised under the name of Polypodium fragile by Linneus and our earlier authors; Sprengel, Willdenow, Schkuhr, Wahlenberg, and other eminent botanists, make them Aspidia. Bernhardi was the first to separate them from this unmanageably extensive group, under the generic name of Cystopteris; Roth gave them the name of Cyathea, and Smith that of Cystea, the latter being a mere alteration from Bernhardi's prior name, because Cystopteris is "compounded of another established" name, Pteris, (Eng. Flor. iv. 285). The name has been altered to Cistopteris by several modern authors, an orthography at variance with the Greek derivation: in fact, there is no sufficient reason for altering or modifying a name that possesses the acknowledged right to adoption on account of its priority.

My views having in more than one instance undergone considerable modification as regards the limits of species, I turned my attention to the cultivation of the beautiful little ferns I have always grouped together under the name of Cystopteris fragilis, in the hope of discovering some characters whereby the various forms might be satisfactorily distinguished from each other. Several botanists of eminence have undertaken, somewhat too readily, the establishment of new species; dwarf size, imperfect fructification, or even, in more than one instance, mere accidental deformity, having furnished the chief diagnostic. Now, as in Zoology we endeavour to refer the females and young, and even individuals that have undergone mutilation, to the same species as the adult male, so would I, in ferns, rather refer specimens which appear in any degree imperfect to some established species, expressing a doubt if I entertained one, than separate such imperfect specimens under a new appellation. In every attempt I make to establish or ascertain a species, I find it most satisfactory to dismiss entirely all such specimens, to refuse all cognizance of them, and to contrast the most perfect and most fruitful fronds only. For, as in Zoology we find specific differences most satisfactorily developed in adults, so shall we also find in ferns; and if essential differences really exist, we shall be sure to see those differences more clearly when Nature has brought the objects under consideration to their highest state of perfection, maturity, and beauty. Entertaining these views, I have dismissed from the

inquiry — as regards the species of Cystopteris — not only all seedling, immature, barren or monstrous fronds, but also all those which appeared to owe their peculiarities to the varied degrees of drought or moisture, elevation, protection or exposure, or the numerous other casualties to which so hardy yet fragile a fern is by its nature subjected; and to compare those only which, cultivated under corresponding circumstances, had arrived at a corresponding state of maturity. The result of a very careful scrutiny of a number of plants, received through the great kindness and exertion of botanical friends, under the names of fragilis, dentata, angustata, and alpina, is, that I am unable to give my assent to the species described by Sir J. E. Smith, or to propose others for substitution in their stead. I find that differences, however striking, subside under cultivation; and that almost entire uniformity obtains amongst greenhouse plants, which, when found growing under varied circumstances of soil, aspect and altitude, exhibited great discrepancies as to size and subdivision of parts. Under these circumstances, I prefer treating them still as constituent parts of a single species, not even naming as varieties those aberrations from normal figure which possess no permanency.

Geographical Range.

This pretty and fragile, but very hardy species, has an extended range in the northern temperate regions, extending to very high latitudes. In Europe it occurs in Norway, Lapland, Sweden, Russia, Denmark, Poland, France, Germany, Hungary, Portugal, Spain and Italy; it extends throughout Asiatic Russia into Kamtkatcha, and has been gathered on the shores of Kotzebue Sound and Eschscholtz Bay; it is frequent in Canada and the Northern States of America; it is also reported from Northern and Southern Africa, and from the Islands of the Pacific Ocean.

In Great Britain it also has a wide range.

Scotland.—Observed more or less abundantly in every county I visited.

England. — In the northern counties, Northumberland, Cumberland, Durham, Westmoreland, Lancashire and Yorkshire, it is very abundant; so also in Derbyshire and Staffordshire, and, further south, in Gloucester-

shire, Wiltshire and Somersetshire: it has a few scattered localities in Cheshire, Shropshire, Herefordshire, Worcestershire, Warwickshire, and Devonshire; and in Nottinghamshire, Northamptonshire, Norfolk, Suffolk, Essex, Kent, Surrey, Sussex and Dorsetshire, it is said to have been found here and there on churches and in villages.

WALES.—Frequent, more especially in hilly regions, both North and South.

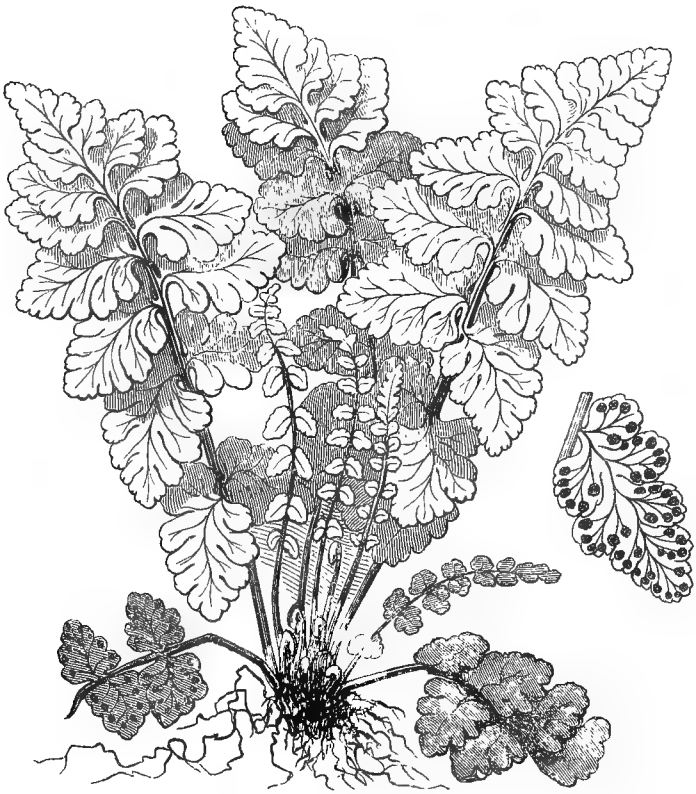
IRELAND. — Generally a rare fern: it occurs, however, in immense profusion about Sligo, and also in some parts of Kerry; and is reported from Antrim, Down, Leitrim, Wicklow, and Cork.

Description.

The radicles are numerous, black, and wiry: the caudex is elongated horizontally but very slowly, the extremity always having a vertical position, and terminating in a crown of unexpanded fronds. The fronds begin to unfold early in the spring, and appear very evanescent, generally arriving at maturity in a few weeks; a constant succession of fronds is produced throughout the summer and autumn, but all disappear with the first frosts of winter. The general form of the frond is lanceolate and pinnate: the pinnæ are also pinnate; but beyond this they appear to possess no character in common. The length of the stipes is very various. The lateral veins are alternate, and each is usually divided into three or four branches, one extending to every serrature in each lobe of the pinnule. The lower detached figure in the cut at page 87, represents a pinnule, showing the veins and points of attachment of the capsules; the figure immediately above it represents a lobe of the same pinnule: almost every vein bears a cluster of capsules near its extremity; the cluster is nearly circular, and has a loose, white, membranous involucre, attached on one side only, beneath the capsules; its margin, at the farthest extremity from its attachment, is striated, and becomes split into capillary segments, or sometimes torn in a ragged manner, and at length entirely disappears: the clusters of capsules rapidly increase in size, frequently becoming confluent, as represented at page 87, where the apex of a frond, with confluent clusters, is shown towards the upper right hand of the cut. In cultivation, I

have observed that sometimes, from the plant receiving a check from exposure or improper treatment, the masses remain of small size, and covered with the involucre, even after the frond has withered.

What I have already written under the head of Synonymes &c., precludes the necessity of observations on varieties; I will, however, mention, that the late Samuel Gibson, of Hebden Bridge, obligingly gave me a number of pretty and diminutive fronds, which he gathered at Burnley, near Colne, in Lancashire; five of these are represented below.



DICKIE'S FERN, (*natural size*).

Characters.

Genus.—CYSTOPTERIS, (see page 87).

Species.—DICKIEANA. Caudex elongated horizontally, but very slowly, its elongation due solely to the successive development and decay of fronds: stipes very much shorter than the frond: frond erect, rigid, lanceolate, pinnate: pinnæ deflexed, broad, overlapping, crowded, subopposite, pinnatifid: clusters of capsules submarginal, very distinct: involucre generally wanting; seeds verrucate: colour bright somewhat glossy green.

Synonymes, Figures, &c.

Cystopteris Dickieana, *Sim, Gard. Journ.* p. 308; *Newm. Phytol. App.* xxvi.

Mr. Babington makes a second species of Cystopteris, under the name of dentata, and places Dickieana as a variety thereof; (Man. 412). Sir W. J. Hooker gives dentata as a variety of fragilis, and angustata of Smith as a mere synonyme of that variety; he makes no mention of Dickieana: (Sp. Fil. i. 198). Mr. Watson heads his first species of Cystopteris thus: —

"1379. Cystopteris fragilis, *Bernh.*
1379, b. Cystopteris dentata, *Hook.*
1379, c. Cystopteris angustata, '*Sm.*'
Cystopteris Dickieana (*Sim.*) *Newm.*"

Mr. W. correctly adding, "opinions differ much as to whether one species only, or several species are included under the above quoted names:" (Cyb. Brit. iii. 258). The authors of the 'London Catalogue' give b. dentata as a variety of fragilis, and do not mention Dickieana or angustata. Lastly, Mr. Moore says, "I am inclined to think C. dentata to be sufficiently distinct to take rank as a species, and to look upon C. Dickieana as an extreme form of it;" (p. 77): but he gives only two species of Cystopteris, fragilis and montana; thus appearing, in the same breath, to express and renounce an opinion. My own judgment, improved, but by no means matured, by the observations of sixteen years, regards dentata as a nonentity, angustata as a synonyme of that nonentity, and Dickieana as a *possible*, but by no means *established*, species.

Geographical Range.

Scotland.—This fern is known to botanists from a single locality only, a sea cave near Aberdeen, where it was found by Dr. Dickie, who has kindly supplied me with wild specimens. The three large fronds represented at page 93 are from this station, and not from a cultivated root.

Description.

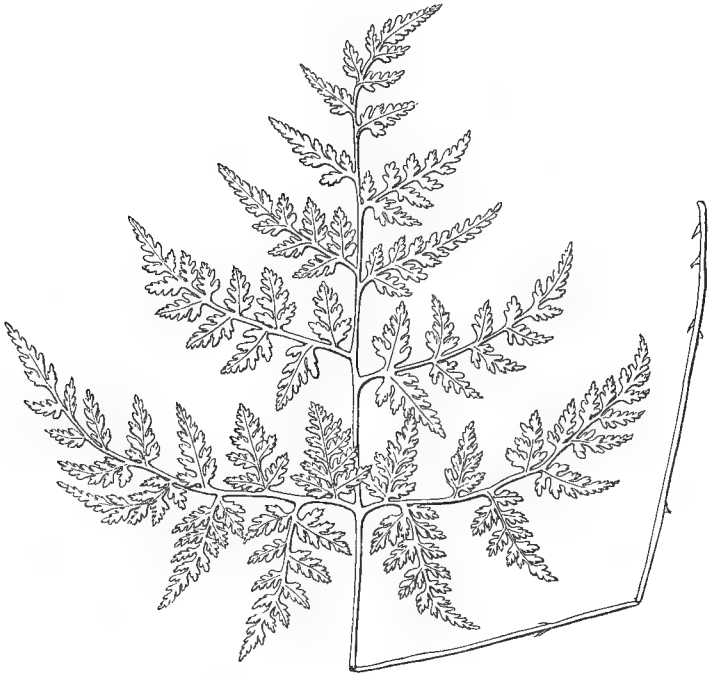
The radicles are tough, numerous, and nearly black: the caudex is tufted, exhibiting very conspicuously a pale brown salient crown, composed of the future fronds: the stipes is short, scarcely half as long as the frond: the frond is ovate-lanceolate, pinnate, compact, somewhat glabrous, and of a full bright green colour: the pinnæ are crowded, deflexed, broad, blunt, and pinnatifid; they are set on at an acute angle with the plane of the rachis: the pinnules or lobes are crenate: the fructification abundant: the clusters of capsules small, round, submarginal, and generally naked: the involucre, when present, is small, its margin fringed, its attachment beneath that of the capsules: the seeds verrucate.

Since, with the single exception of Mr. Sim, the original describer, no author has ventured to regard C. Dickieana as a species distinct from C. fragilis, a few words appear absolutely necessary as to the propriety or otherwise of regarding this fern as distinct. The objections to separating it are two: — first, the present restriction of the species to a single locality, and that a very peculiar one; and, secondly, the absence of any obvious botanical character whereby it may be distinguished from C. fragilis. Both of these objections are my own; they are difficulties first suggested by myself, and therefore I am fully prepared to assert their importance, and shall make no attempt whatever to reason them away. The propriety of separating Dickieana from fragilis rests on these grounds: — It is a healthy perfect plant, not monstrous or distorted, and it produces its like from seed for many generations. It is reproduced freely from seed, becoming a perfect weed; whereas fragilis, under similar treatment, rarely reproduces itself. Cultivated in the same soil, and in the same pot, with fragilis, the latter becomes larger and more vigorous, Dickieana smaller and less vigorous: and the more care the cultivator bestows on these two plants, the more will he find they recede from each other; whereas all differences between the so-called C. fragilis, angustata, and dentata are speedily lost in cultivation. It is true that Dickieana, under cultivation, undergoes some change: its pinnæ are deflexed, crowded, and partially overlapping in a

wild state; they become more deflexed, crowded, and overlapping under cultivation: the pinnæ of fragilis are generally ascending, separate and distinct in a wild state, and they become more ascending, distant and divided under cultivation: Dickieana is of a bright glossy green in a wild state, and fragilis of a dull somewhat glaucous green; this difference of colour is not only maintained but increased under cultivation: finally, and this is a botanical diagnostic, Mr. Wollaston assures me that the seeds of fragilis are always echinate, those of Dickieana simply verrucate. The reader is requested to try the plant by these tests, and if they fail, the species fails also.

Culture.

These little ferns grow freely and luxuriantly in the usual soil of gardens in the counties where they are indigenous, requiring only shade and moisture: on the north side of loose stone walls, provided purposely, fragilis seems especially to flourish. In pots it appears still more at home, if they stand in a cool and well-ventilated greenhouse, and the soil composed chiefly of peat, with a small portion of thoroughly decayed leaf-mould and fine sand: the caudex to be fixed in an erect position between stones, as recommended for the Woodsias. Wr. Wollaston, whose judgment in all such matters is most excellent, recommends the addition of loam. The pots should stand in water, half an inch deep; and the reader must recollect, whenever this is recommended, that it is indispensable that there be lumps of charcoal at the bottom of the pot: this corrects the tendency to impurity which water, when still, is so apt to exhibit. Dickieana, like fragilis, is remarkably easy of culture, but, like all other sea-side ferns, enjoys the protection afforded by glass.



WILSON'S FERN, (*natural size*).

Characters.

Genus.—CYSTOPTERIS, (see page 87).

Species. — MYRRHIDIFOLIUM. Caudex a stolon-like creeping rhizome: stipes erect, longer than the frond: frond deltoid, pinnate: the lowest pair of pinnæ nearly opposite, shortly stipitate, each almost equal in size to the apical portion of the frond; all the pinnæ once, the lower pair twice pinnate: an obtuse angle is formed at the union of the first pair of pinnæ with the stipes and rachis: clusters of capsules circular, and, when the frond is immature, *generally* accompanied by an obscure torn involucre, which is attached to the dorsal surface of the capsuliferous vein immediately behind the point of attachment of the capsules.

Synonymes, Figures, &c.

Polypodium Myrrhidifolium, *Vill. Hist. Plant. Dauph.* iii. 851, t. 53.

Polypodium montanum, *Allioni, Pedem.* No. 2410; *Lam. Fl. Fr.* i. 23.

Aspidium montanum, *Swartz, in Schrad. Journ.* ii. 42, *Syn. Fil.* 61; *Willd. Sp. Pl.* v. 286; *Schkuhr*, p. 61, t. 63; *Hoffm. Fl. Germ.* ii. 10; *DC. et Lam. Fl. Fr.* ii. 558; *Sadler*, 43.

Cyathea montana, *Smith, Mem. Acad. Turin*, v. 40; *Roth, Fl. Germ.* iii. 100.

Cystopteris montana, *Link, Hort. Berol.* ii. 131; *Koch, Syn.* 981; *Presl, Tent. Pterid.* 93; *Fries, Summa*, 82; *Newm. Phytol.* i. 671, *N. A.* 15, *F.* 13 & 159, *Phytol. App.* xxv.; *Hook. and Arn.* 572; *Bab.* 413; *Moore*, 80; *Ledeb. Fl. Ross.* xiv. 517; *Godet, Flore du Jura*, 856.

I think the name of Polypodium montanum was conferred on this plant against all the rules of botanical nomenclature, Vogel having given that name to another species eight years previously; and in the present unsettled state of fern-nomenclature, it seems far from improbable that both species will be again included in one genus, as they were in the time of Allioni. As they were then both called Polypodium montanum, so they must, with those who retain Bory's genus Lastrea in its entirety, both be Lastrea montana. Moreover, Villars's name of Myrrhidifolium, having the claim of priority, relieves us of all difficulty on the score of its adoption. With regard to the genus, I have no doubt that those who have seen this beautiful little fern on its native hills, or have successfully cultivated it, will readily agree that its affinities are with Dryopteris and Robertianum, rather than with fragilis: the stolon-like rhizome, the triangular frond, the elbowed rachis, and the generally naked clusters of capsules, all show the necessity for its eventual removal from the genus with the species of which it has hitherto been associated. The original figure of this fern in Villars's 'Histoire des Plantes de Dauphiné' (tab. 53), well represents its form and characteristics; that in Schkuhr (tab. 63) is also excellent, leaving nothing to be desired.

Geographical Range.

The geographical range of this fern is very extensive. It is found in Norway, Sweden, Germany, France, Italy, Spain, and Hungary; indeed, Sadler (De Fil. Ver. 55) says that it occurs in all the Provinces (*sic*) of Europe except Britain. I do not trace it in Asia, except in Kamtkatcha, of which peninsula it is a native, according to Mertens, Ruprecht, and Ledebour. It is abundant on the Rocky Mountains of North America, and has also been reported from the Andes of South America: from the former locality I have seen specimens, through the kindness of Mr. Smith; the latter locality requires confirmation.

In Great Britain the range of this fern is more restricted than that of any other species, being confined, as far as we yet know, to one county in Scotland. I had the pleasure of first introducing this fern to the notice of British botanists in 1844, and give below all the information published respecting it from that time to the present, including the first announcement. But, it should be added, that our excursions into Scotland are generally of such short duration, that the fact of its ascertained range being so restricted, appears more the result of this circumstance, than of its absolute scarcity.

Scotland.—"I found this fern on Ben Lawers (in Forfarshire), while botanizing in company with Professors Hooker and Graham, in August, 1836. I do not think it probable it could have been introduced by accident, much less by design. It grows in a part where Saxifraga rivularis is or was occasionally found, but so rarely that I never saw it but once, when Sir W. J. Hooker pointed out a starved and scarcely intelligible plant; the scarcity therefore of the fern is no argument against its being truly indigenous. I gathered all the fronds I saw, but left the root, and think that I could find it again."—Mr. Wilson in a letter to myself, see Phytol. i. 671. "Corrach-Uachdar, July, 1841: Messrs. W. Gourlie and W. Adamson." —Hook. & Arn. 572. "I have observed the notice respecting Cystopteris montana on the wrapper of the 'Phytologist' for November last. I had the pleasure of gathering the plant in August last, in Breadalbane, not in Mr. Wilson's place in Ben Lawers, which has not, I believe, been rediscovered, but in the range of mountains between Glen Dochart and Glen Lochay, where Messrs. Gourlie and Adamson found it in 1841. From these gentlemen Dr. Arnott obtained a direction to the spot, and kindly

accompanied me thither. The station is recorded in the sixth edition of the 'British Flora,' under the name of Corrach-Uachdar, but a native of the neighbourhood called the mountains Meal Oufillach, and the ravine Corrach Dh' Oufillach, as nearly as I could express his pronunciation. He could not spell the words."— Mr. Borrer, in Phytol. iv. 7. "Previously to my setting off for Scotland on the 1st of this month, August, 1853, I was not able to get any information respecting the locality for Cystopteris montana, more than I obtained from the pages of the 'Phytologist;' and when arrived within the district, in reply to my inquiries respecting Corrach Uachdar or D'Oufillach, no one that I met with had ever heard of such names, though I took great pains in making clear what ought to be its situation, and the way in which the names were spelled, not trusting to my pronunciation. Such being the case, I was obliged to trust to myself, and search diligently, and had the pleasure of discovering a locality for the said fern, which I suppose is the third in which it has been found in Scotland; it is not Mr. Borrer's station, directions for which I have since received, but may be six or eight miles distant from it. I found only one frond in fruit."—Mr. Westcombe in Phytol. iv. 1098. From the Rev. Mr. Little, who has also been successful in finding Myrrdidifolium in Scotland, I learn that the geological formation on which it occurs is mica-schist.

(Wales.—Caernarvonshire :—"Cystopteris montana, recently described in the 'Phytologist' as a newly discovered British plant, is stated by Sprengel to have been found in Wales by Plukenet, who figured it in his 'Phytographia,' tab. 89, f. 4, but I have not seen the figure."— Mr. H. O. Stephens, in Phytol. i. 875. Mr. Watson having noticed this suggestion (Cyb. Brit. iii. 259), it seems desirable to examine it. On reference to Plukenet, I found that accurate botanist and phytographer giving Ray as his authority in the present instance, and referring the reader to Ray's 'Synopsis,' p. 27. Here is the passage: — "Filix *montana* ramosa minor argutè denticulata. *Small branched mountain fern with finely indented leaves.* Ad summitatem montis *Glyder* quà lacui Llyn Ogwan imminet. *D. Lloyd.* Singulare quid in hac specie esse videtur quòd in alis sui ramulis infimis surculi ad alæ costam inferiores oppositis longiores sunt, præsertim scapo proximi notabili differentia." On this I may remark :— 1. That the plant in question was found in Wales by Lloyd, not by Plukenet. 2. That the record is Ray's. 3. That the similarity of specific name is merely accidental, although Sprengel's record is based thereon. 4. That the character described by Ray is common to all the Lophodiums hereinafter to be described. And, 5. That Plukenet's figure faithfully and beautifully represents a small frond of Lophodium Fœnisecii, precisely similar to some lately gathered in North Wales by Mr. G. Maw, and kindly submitted to my inspection).

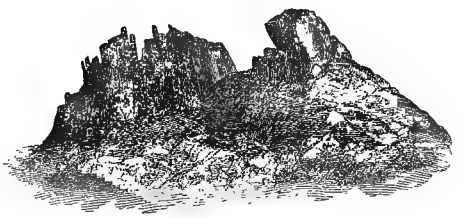
Description.

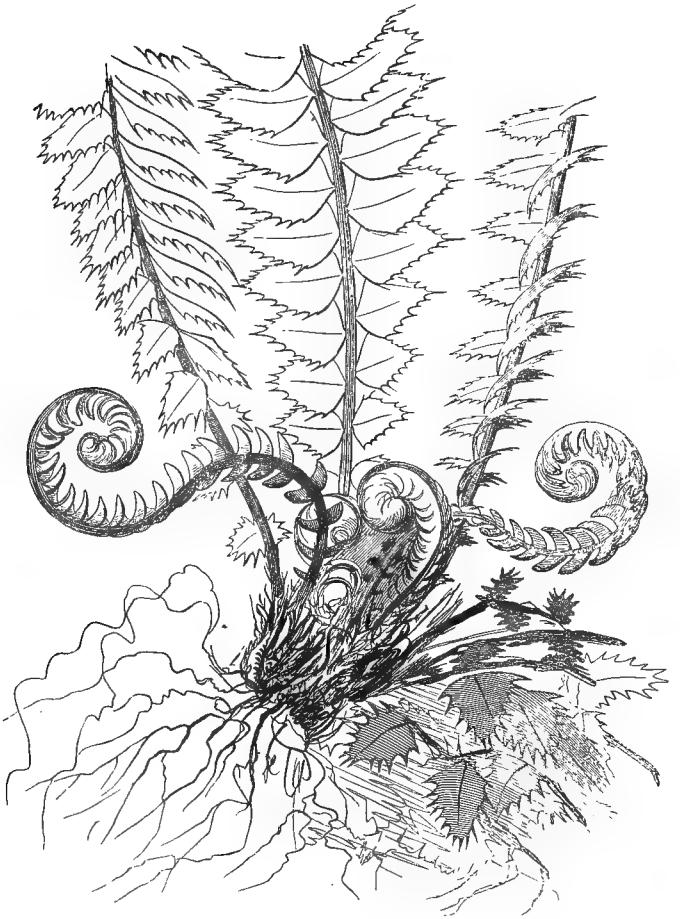
The radicles are fibrous, black, and clothed with fibrillæ: the caudex is a brown stolon-like rhizome, which, when creeping among moss in wet situations, especially on the ledges of dripping rocks in mountain ravines, is almost constantly wet. I am indebted to Mr. Westcombe for a portion of rhizome in a living state, and have been successful in growing it in the method hereinafter described. From the rhizome the fronds rise at irregular distances, each on a slender erect stipes, which is somewhat longer than the frond, and has a few nearly diaphanous pointed scales scattered near the base, where it is brown, the upper portion being green and concolorous with the frond: the frond is nearly horizontal, being elbowed at its junction with the stipes; it is triangular in form, and pinnate; the first or lowest pair of pinnæ being nearly opposite, and very much larger than any of the others, indeed, nearly equalling in size all the rest: these pinnæ are pinnate, the pinnules are also pinnate; the lobes are deeply pinnatifid, and their divisions notched: it is, therefore, one of the most compound of our ferns: the second pair of pinnæ are nearly opposite, but the remainder gradually become alternate. The first inferior pinnule of the lowest pair is very much larger and more divided than the first superior pinnule of the same pair; this disproportion decreases gradually, until, at the apex of the pinna, its opposite pinnules nearly correspond in size. All the specimens found by Mr. Wilson, and all but one of those found by Mr. Westcombe, were without fruit; but this is an evident departure from the usual character of the fern, the entire under surface being commonly covered with clusters of capsules. The late lamented Mr. E. Forster very kindly lent me, for the present work, a Swiss specimen, just in that state of incipient fructification which best displays the involucre. The lateral veins are alternate; each generally ceases in a sinus between two serratures: the involucre is attached at the back of each lateral vein, and bends slightly forwards over the capsules; it is very unequal in size, and often entirely wanting; its free anterior margin is jagged and uneven. The masses of capsules are nearly circular, and become very prominent when mature;

although crowded, each appears to retain its individuality, and they never seem to become perfectly confluent.

Culture.

A small quantity of Sphagnum and charcoal should be spread over the bottom of a common seed-pan: this should be covered to the depth of two inches with a mixture of thin laminæ of freestone or mica-schist, sandy peat, clean sand, and thoroughly decayed leaf-mould; the last in small quantities: arrange the rhizome on this, and cover it with more of the mixture: place the pan in a cool greenhouse, out of the reach of sunshine. In summer, while the fronds continue to be developed, cover the pan with a bell glass, in order to secure a moist atmosphere; but before winter, remove the glass and expose the plant to the weather, watering it daily, except during frost and snow. The Rev. W. Little finds this fern grow freely in the open air in Dumfriesshire.





HOLLY FERN, (*natural size*).

Characters.

Genus. — POLYSTICHUM. Midvein of pinnule or ultimate division distinct; lateral veins branched: clusters of capsules seated on the anterior branch, covered by a circular, scale-like,

peltate involucre, which is attached by its centre and is free at its circumference: first superior pinnule greatly larger than the second, and evidently larger than the corresponding inferior pinnule: all the ultimate divisions of the frond end in acute rigid spines: caudex woody, erect, long-enduring, and terminating in a corona of fronds.

Species. — LONCHITIS. Caudex tufted: frond almost estipitate, linear, rigid, leathery, glabrous: pinnæ entire, auricled at the base, crowded, overlapping, set on at an angle with the plane of the rachis, serrated, serratures spined: clusters of capsules circular, crowded, often confluent, confined to the upper parts of the frond.

Synonymes, Figures, &c.

Polypodium Lonchitis, *Linn. Sp. Pl.* 1548; *Lightf. Fl. Scot.* 668; *Huds. Fl. Ang.* 455; *With. Arr.* 773; *Sm. E. B.* 797.

Polipodium Lonchitis, *Bolt. Fil. Brit.* 34, t. 19.

Aspidium Lonchitis (*Swartz*), *Sm. E. F.* iv. 284; *Mack. Fl. Hib.* 338; *Franc.* 32; *Hook. and Arn.* 568.

Polystichum Lonchitis (*Roth*), *Newm. N. A.* 25, *F.* 163, *Phyt. App.* xvi.; *Bab.* 411; *Moore*, 83.

This rare fern appears to have been very familiar to our older botanists and herbalists, both here and on the continent of Europe: it is mentioned by the Bauhins, Gerarde, Parkinson, Ray, and the anonymous author of the 'British Herbal,' and has repeatedly been figured in a very characteristic manner. All authors seem agreed on the specific name: the generic name is not so universally adopted; but the species Lonchitis being the type of the genus Polystichum, and that name being anterior to the conflicting one of Aspidium, there is little doubt it will be eventually received, more especially as modern pteridologists are agreed in restricting the genus Aspidium to the three species placed as typical by its author, and such other subsequently discovered species as agree therewith in essential characters. The genus Aspidium, as instituted by Swartz, and as restricted by Presl, contains Sp. 1, trifoliatum; Sp. 2, macrophyllum; and Sp. 3, Heralceifolium.

Geographical Range.

It seems desirable, under this head, to express a doubt as to whether the fern known by this name on the continent is precisely identical with our British plant. The specimen in the Linnean herbarium rather resembles a seedling of the following than a mature plant of the present species; and the habitat given by European botanists does not quite correspond with those in which it occurs in Britain: it is said to grow in the "bois montagneux" of France, in the "sylvis montosis subalpinis" of Lower Germany, in the "umbrosis alpestribus" of Transylvania, in the "fôrets" of the Jura, and so forth; the inference being that it is a sylvan rather than a rupestral plant. The name of the fern occurs in the Floras for Lapland, Sweden, Denmark, Germany, Hungary, France, Switzerland, Italy, and Russia; it also appears to occur throughout Asiatic Russia, even including Kamtkatcha; and it is said to be a native of North America: Sadler states it has not been found in Spain.

In Britain it is a rare fern, being confined to bleak and exposed mountains: its chief localities are as under: —

In Scotland it has been found and recorded in no less than nine counties, by botanists whose knowledge of the plant cannot be questioned: these are Sutherland, Ross, Inverness, Moray, Aberdeen, Forfar, Perth, Argyle, and Dumbarton: the chief stations are Ben More, in Sutherlandshire; Ben Lawers and Craig Challiach in Perthshire; the Clova Mountains, Glen Fiadh, and Craig Maid in Forfarshire. I have to acknowledge the kindness of Drs. Greville and Balfour, and Mr. Kippist, in supplying me with Scotch specimens, and my obligations to Messrs. Backhouse, Gardener, Gourlie, Stables, Watson, and Westcombe, for information as regards localities, &c. It is next to impossible to look at a map of Scotland, and observe how large a space is occupied by the nine counties enumerated above, without regarding it as a widely distributed fern in that kingdom. Lanark and Orkney have been added, but Mr. Watson (Cyb. Brit. iii. 261) does not seem inclined to accept the authority as satisfactory.

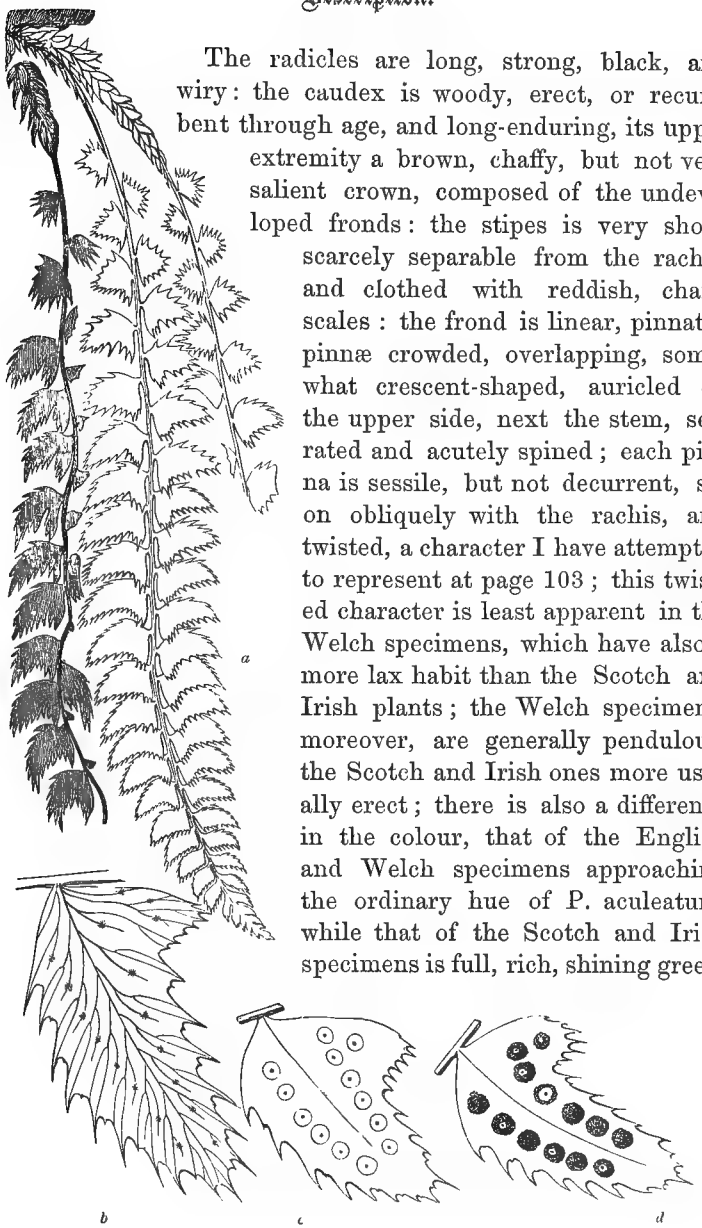
In England, its discovered habitats are almost confined to the single county of York: I am indebted to Mr. Tatham for specimens from the neighbourhood of Settle; to Mr. Thompson, for others from Attermire Scar; and I have seen others gathered on Ingleborough. Mr. Backhouse, and many other botanists, have seen it growing in great luxuriance on Falcon Clints, in Teesdale, just where the basalt joins the limestone. This

locality is ten miles west of Middleton, and on the Durham side of the stream, although immediately adjoining the county of York.

In Wales I believe it has been discovered in one county only, and here it has been known ever since the time of Ray, who described the habitat in these words :—"E rupium fissuris emergit in summis jugis Arvoniæ v. g. *Clogwyn y Garnedh y Grib Goch Trygvylchau, D. Lloyd.*" In this station it has been since recorded by Bolton; and Hudson says it is plentiful on the mountains above Llanberis, which probably means the Clogwyn y Garnedh station, and this station, as well as Cwm Idwell, have frequently been recorded by living botanists. The Rev. Mr. Pinder, who found it on Snowdon, as well as on Glyder Vawr, and at both places in fructification, observes that the plants are more lax in their habit than those from Scotland; and my own experience quite confirms this observation. I was successful in finding the plant in several localities near the upper extremity of Twll dhû, that remarkable fissure which opens into Cwm Idwell, and which, the tradition of the neighbourhood asserts, was rent at the crucifixion of our Saviour, a tradition to which few educated men will be inclined to listen. It grows, not only at the immediate upper entrance of the fissure, but also on the right, near the spot where Anthericum serotinum is found; a dangerous locality, by the way, and one which requires the botanist to possess a firm foot and a cool head. Again repassing the upper entrance of the fissure, and descending towards Llyn Idwell by the precipitous and somewhat instable surface of the rock, P. Lonchitis occurs sparingly among thousands of plants of P. aculeatum of every form that can be imagined. In this natural botanical garden, large plants of a mountain Thalictrum form prominent and striking objects. Mr. G. Maw has lately shown me a fine specimen of this fern from the Snowdon district.

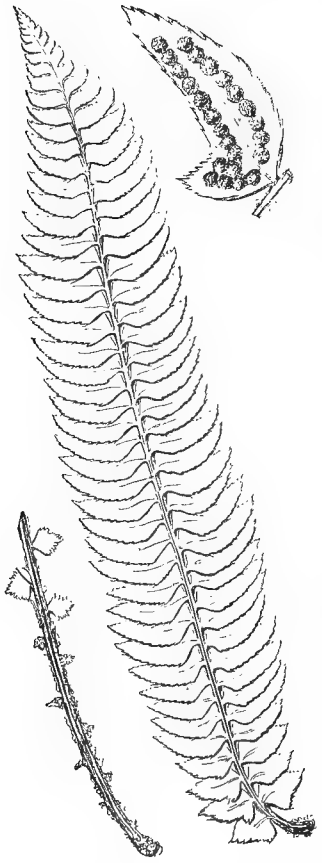
In Ireland, Polystichum Lonchitis is a rare fern, but occurs in a few localities, of a very rigid, erect, and characteristic form. Mr. David Moore, of the Glasnevin Botanic Garden, at Dublin, a botanist to whom I am indebted for much valuable information, has found it in the Rosses and Thanet Passes in the county Donegal. Dr. Mackay, of the College Botanic Garden, at Dublin, another Irish botanist to whom my best thanks are due, found it on the Ben Bulben mountains, in the county Sligo, in 1833, and remarks that it had been previously found there by Mr. E. Murphy: and Mr. W. Wilson, Mr. S. P. Woodward, Mr. Ward, and a number of other botanists, have found it on Brandon Hill, in the county Kerry: to Mr. Woodward I am indebted for specimens from this locality; and to Mr. Ward for the sight of others, truly curious from the size and solidity of their caudices, which have probably weathered the mountain storms for hundreds of years: the basal portion of each frond still remains *in situ*, and the solid caudex, of which they form an integral part, forcibly reminds one of the more erect and elongate stem of a tropical tree-fern.

Description.



The radicles are long, strong, black, and wiry: the caudex is woody, erect, or recumbent through age, and long-enduring, its upper extremity a brown, chaffy, but not very salient crown, composed of the undeveloped fronds: the stipes is very short, scarcely separable from the rachis, and clothed with reddish, chaffy scales: the frond is linear, pinnate: pinnæ crowded, overlapping, somewhat crescent-shaped, auricled on the upper side, next the stem, serrated and acutely spined; each pinna is sessile, but not decurrent, set on obliquely with the rachis, and twisted, a character I have attempted to represent at page 103; this twisted character is least apparent in the Welch specimens, which have also a more lax habit than the Scotch and Irish plants; the Welch specimens, moreover, are generally pendulous, the Scotch and Irish ones more usually erect; there is also a difference in the colour, that of the English and Welch specimens approaching the ordinary hue of P. aculeatum, while that of the Scotch and Irish specimens is full, rich, shining green,

the substance thick and leathery, and the entire frond as rigid and prickly as a spike of miniature holly-leaves, so much so, indeed, that the fronds are not to be flattened for the herbarium without considerable difficulty. The lateral veins are alternate and generally three-branched, the anterior branch usually terminating half way between the midvein and margin, the others reaching the margin, but being quite free at their extremity. It should, however, be observed, that the auricle or lobe at the base of each pinna has a formula of venation decidedly different from the remainder of the pinnule, since the principal vein in this lobe emits several fruitful branches in an opposite direction to that taken by the rest. The involucre is circular, and attached to the back of each anterior branch of the lateral veins near its extremity; the attachment is by a short central cord: the capsules are attached to the vein around the base of the cord of the involucre, and, as they reach maturity, form a circular cluster, and these clusters a continuous line on each side of the pinna, about equidistant from its midrib and margin. Some specimens are so densely seeded that the masses become confluent. In the Irish, as in all other specimens, the clusters of capsules are most abundant towards the apex of the frond, but they are *also* scattered throughout the other parts, even to its base; whereas in the Scotch, Welch, and particularly the English specimens, the masses are confined to the upper part of the frond. Mr. Tatham, in allusion to these observations, remarks that in the



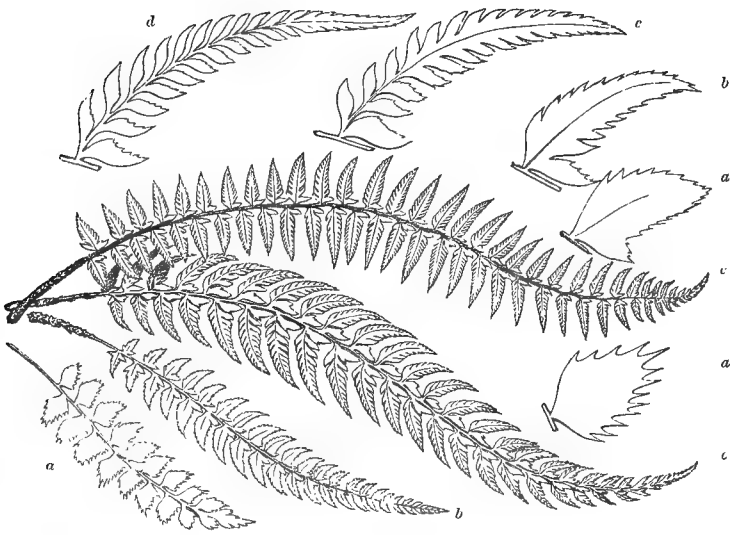
Settle plant "the seed is generally confined to about a third of the frond, but I have some that are half covered."

The fronds represented at page 103, are from Scotland; those at page 107 from Wales: figure *b* shows the venation, and the points whence the clusters of capsules have been removed; figure *c*, represents a pinna with the fructification in a very young state, the peltate involucre alone being visible; figure *d*, another pinna, in which the clusters of capsules have enlarged, and more or less concealed the involucre: the figures at page 108 are from an Irish plant.

Culture.

A difficult plant to establish, and even when apparently established, often disappointing the cultivator. Still, nothing can exceed the vigour which it displays when grown in the open air in some parts of Ireland, perhaps, indeed, throughout Ireland; but I may speak of Belfast and Dublin, as places in which I have particularly observed it: on rock-work in the sister island it forms strong permanent masses, often displaying fifty fronds at once. In Scotland and the North of England, I have had little experience of the success attending its cultivation in the open air; but in the South of England it rarely thrives: when potted, and kept in a cold frame or cool greenhouse, it succeeds better. The following directions may possibly be of some service to those who incline to encounter the trouble and reap the reward of pot-culture. Place the caudex erect between two flattish pieces of sandstone or freestone, and then block up the space between them and the sides of the pot with other pieces of stone: do this *tightly*, compressing the caudex, keeping its crown well above the pot, and allowing the roots to hang down; then fill up with a light mixture of peat and sandy loam, and shake it gently down until the interstices of the stone are thoroughly filled. In watering this fern, it is best to keep the water entirely from the leaves, unless, by thorough ventilation, you can ensure rapid evaporation.

I have more than once mentioned Cwm Idwell as a station for ferns: below is a very humble attempt to give an idea of this wild spot. It was sketched in a memorandum-book, and carried on my back among fern-fronds for many a weary mile. Cwm Idwell is a vast semicircular rampart of rock, near the middle of which, invisible at a distance, is the perpendicular fissure called Twll dhû: through this falls a mountain stream, which, emerging at the foot, wanders, amongst fragments of disrupted rock, into Llyn Idwell, — that dark, still lake which reposes in the natural basin; issuing thence, it joins the waste water of Llyn Ogwen, and the united stream flows through the mighty pass of Nant Frangon to the sea. In Llyn Idwell grow Isoetes, Subularia, and Lobelia: on the broken ground about the lake, Lycopodium alpinum, L. Selago, L. selaginoides, and L. clavatum, every conceivable form of Cystopteris fragilis, with Allosorus crispus, and Hymenophyllum unilaterale: a little higher up, Polystichum Lonchitis, Asplenium viride, Rhodiola rosea, an alpine Thalictrum, and, that rarity of rarities, Anthericum serotinum: and, still higher, above and beyond the summits that we see, Woodsia Ilvensis and Lycopodium annotinum. Oh! it is a matchless place for a botanical ramble!



PRICKLY FERN, (*one-sixteenth the natural size*).

Characters.

Genus.—POLYSTICHUM, (see page 103).

Species.—ACULEATUM. Caudex tufted: stipes short, densely chaffy: frond linear, rigid, leathery, glabrous, bipinnate: pinnæ pinnate or pinnatifid: pinnules distinct (aculeatum, *Sm.*) or decurrent (lobatum, *Sm.*), serrate; serratures spinose: clusters of capsules circular, crowded, often confluent, confined to the upper part of the frond.

Synonymes, Figures, &c.

Polypodium aculeatum, *Linn. Sp. Pl.* 1552.

Polypodium lobatum, "affinis præcedenti [P. angulare, *inf.*] an distincta sit species?" *Huds. Fl. Ang.* 459; *With. Bot. Arr. Veg.* 651.

Polipodium aculeatum, *Bolt. Fil. Brit.* 48, t. 26. "Polipodium lobatum, *Hall. Hist.* 1712, and *Fl. Ang.* 459, is doubtless a young plant of Polipodium aculeatum; of this I am certain from observation."—*Bolt. l. c.*

Aspidium lobatum, (*Swartz*), *Sm. E. F.* iv. 291; *Mack. Fl. Hib.* 338.

Polystichum aculeatum, (*Roth*), *Newm. N. A.* 25, *F.* 169; *Bab.* 411.

The division of the bipinnate aculeate ferns into *three* species, in all probability originated in a mere error of nomenclature. I arrive at this conclusion from a careful consideration of the original descriptions. Linneus considered the plants referrible to a single species, to which he gave the name of "aculeatum." Hudson, observing the great discrepancy between the extreme forms, divided them into two species, calling the rigid and least divided form "lobatum," and the lax and most divided form "aculeatum." Kunze adopted these names; but Willdenow redescribed the species, transferring the name aculeatum to Hudson's lobatum, and giving the new name of "angulare" to Hudson's aculeatum, a transposition that will be rendered clear by the following formula: —

Lobatum, *Huds.* et *Kunze* } = Aculeatum, *Willd.*
Aculeatum, *Huds.* et *Kunze* } = Angulare, *Willd.* } — Aculeatum, *Linn.*

Thus the three names were not intended to represent three objects, a conclusion inadvertently adopted by Sir J. E. Smith, who consequently endeavoured to find characters for all three. There is now a growing disposition to reunite them as one species. DeCandolle in France, Godet in Switzerland, Weber and Mohr in Germany, Ledebour in Russia, and other botanists of unquestioned ability, peremptorily discard the idea of a second species; and Bernhardi, going still further, considers them to be divided forms of Lonchitis. These opinions, however, are not so general as to preclude the necessity for my describing the extreme forms, leaving it, however, to be understood, that the observations on geographical range treat aculeatum and angulare as a single species. From a somewhat voluminous correspondence with British botanists, on the subject of this fern and the next, I find there is a very

general desire to maintain two species — aculeatum and angulare—as distinct, but to omit the third or intermediate species. The characters recommended by my correspondents are very various, and would divide a series in a variety of ways; hence I feel reluctant to publish them.

In the edition of 1844, about eight pages are occupied with quoted descriptions of these ferns, more especially from the writings of Sir J. E. Smith, Sir W. J. Hooker, Mr. Babington, and Mr. Thwaites; but on revising these for republication, and studying them with the careful attention which the writings of these botanists always deserve, I found that no impression whatever remained on my mind as to the distinctness or otherwise of the ferns: the ideas suggested were theoretical, and rather psychical than physical; speculations on the writers, rather than on the objects concerning which they wrote.

I must also observe that Professor Kunze, one of the highest authorities on the species of ferns, published in the 'Flora' of June 14, 1848, an essay on this very subject. It was intituled, "On three species of Ferns hitherto involved in much confusion, Aspidium lobatum, *Sm.*, A. aculeatum, *Sm.*, and A. Braunii, *Spenn.*" An abstract of this essay appeared in the 'Phytologist' (Phytol. iii. 455), and a translation *in extenso* was published in the 1st and 2nd Nos. of the 'Botanical Gazette,' but I believe all botanists consider the confusion to be rather increased than diminished by these well-intended labours. If, therefore, one of the greatest pteridologists has failed in elucidating the matter, it seems scarcely probable that any efforts of a general botanist will accomplish that desirable object.

Geographical Range.

The European range of this fern extends to every country except Spain, where one would rather suppose it unobserved than absent, since it occurs commonly throughout France, especially in the South, and ascends the Pyrenees to the height of 2,500 feet. It is found in Asia, Northern and Southern Africa, and North America: in the latter country it is extremely rare, but perfectly identical with our British plant.

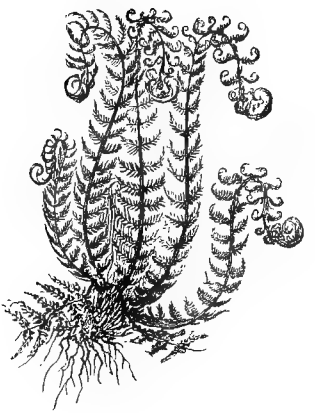
In one or other of its forms this fern seems to be distributed throughout the United Kingdom. I have seen it more or less abundantly in every county I have visited, whether in England, Wales, Scotland, or Ireland; and the lists I have received through the kindness of my correspondents, invariably record its occurrence. It seems to delight in the protection of man, its favourite locality being our hedge-rows; and its luxuriance being greatly increased by cultivation, or even by proximity to cultivated lands: its occurrence on our moors, commons, and mountains, is comparatively rare, its stature diminutive, and its fronds are more sparingly divided.

Description.

The radicles are unusually long, strong, and tough, often taking so firm a hold of the soil, especially when the plant is growing in hedge-banks, among the roots of whitethorn or hazel, as to require great labour in removing. The caudex is very large, apparently increasing slowly with age, and enduring for many years. The young fronds make their appearance in April, the circinate apex being bent backwards, and remarkably graceful in its appearance: the pinnæ of the young frond are also circinate: I have attempted, in the vignette at page 116, to give an idea of this character. The fronds attain their full expansion in July, and the seed appears to have reached maturity in September: the fronds are tough, leathery, and perfectly persistent, retaining their green uninjured by frosts throughout the year, and showing no disposition to decay until the fronds of the succeeding year are fully developed; indeed, they are of so rigid and durable a character, that after changing their green hue for one of brown, they remain almost unaltered in form; and thus Nature often preserves the foliage of three or four successive years attached to the same caudex, displaying to the inquiring gaze of the botanist a variation in character that will often strike him with astonishment. The form of the frond may be termed lanceolate, but it becomes more or less linear, and more or less attenuated towards the base. The stipes is usually very short, and is densely clothed with reddish scales; these are very large and crowded at its junction with

the caudex, but upwards they diminish in size, and are much smaller when the stipes has merged in a rachis. The caudex has always a disposition to fix itself on a perpendicular surface, whence the fronds issue in a nearly horizontal direction, their rigid habit almost precluding the possibility of their assuming that graceful bend which is more or less observable in every other fern similarly situated. The frond is variously divided, but always pinnate: the pinnæ also are variously divided: when entire, as is usually the case in immature plants (see figs. *a a a*, page 111), the fronds resemble those of the preceding species, P. Lonchitis, from which circumstance the name of Lonchitidoides has been applied to this form. When the first upper pinnule is separated from the body of the pinna, which remains nearly entire (figs. *b b*), the plant is the Aspidium munitum of the continent; at least, such is the opinion I gather from the descriptions of Sadler and others: when the pinna is a little more divided (figs. *c c c*), I suppose it to be the Polypodium lobatum of Hudson, and P. aculeatum of Linneus; and, lastly, when the pinnule becomes quite pinnate at the base, and even beyond the middle (fig. *d*), it is probably the Aspidium aculeatum of Smith. I believe that no one who has watched the plant with careful attention, has ever supposed these forms to be more than varieties of a single species. The first upper pinnule on each pinna is much larger than either of the others, indeed, it is usually twice as large as the first lower pinnule; it points directly upwards towards the apex of the frond, but owing to a certain convexity, which every division of the frond in some degree possesses, its point is bent downwards, and very frequently passes below and beyond the midrib of the preceding pinna; the double series of these enlarged pinnules, often amounting to more than twenty, has a very striking appearance: all the pinnules have a sharp spine at their extremity, and several lesser spines at their edges, and each of the enlarged superior pinnules is slightly auricled at its outer margin near the base, and the auricle, in those pinnules near the base of the frond, has a very strong and distinct spine; this character extends to several of the other pinnules which most nearly approach the stem, and these are generally placed on short foot-stalks, whereas all the others are decurrent or united

at the base: the direction which they assume, observable particularly in the inferior pinnules of each pinna, forms an acute angle with the midrib of the pinna. The seed is confined to the upper portion of the frond; and, in its circular involucre attached by a central cord, in its circular clusters of capsules, occasionally confluent but generally separate, and in the distribution of the veins, I find no characters distinct from those which I have already figured as characteristic of the preceding species.



† WILLDENOW'S FERN.

Characters.

Genus.—POLYSTICHUM, (see page 103).

Species.—ANGULARE. Caudex tufted: stipes one-third as long as the frond, densely clothed with large, red, chaffy scales: frond drooping, graceful, broad-lanceolate, lax, feathery, pinnate: pinnæ very numerous, linear, distant, pinnate: pinnules distinct, stalked, often distant, auricled at the base, rounded at the apex, serrated, spined.

Synonymes, Figures, &c.

Polypodium aculeatum, *Lightf. Fl. Scot.* 675; *Huds. Fl. Ang.* 459.

Aspidium angulare, *Willd. Sp. Pl.* v. 257; *Sm. E. F.* iv. 291, *E. B. S.* 2776; *Mack. Fl. Hib.* 339.

Polystichum angulare, *Newm. N. A.* 25, *F.* 173; *Bab.* 409.

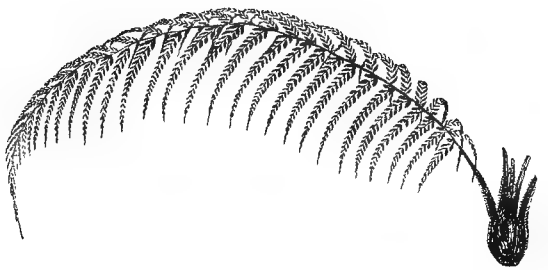
Geographical Range.

For the geographical distribution see page 113.

Description.

The radicles and caudex present no characters by which I can distinguish them from those of the preceding. The stipes is distinct, about one-fourth as long as the frond, and densely clothed with large reddish scales. The plant appears to prefer

a horizontal to a vertical surface: its habit is weak, flexile, graceful and drooping; a number of fronds issue from the



crown of the caudex, and, when uninterrupted, spread from a common centre, presenting a very beautiful appearance: the texture of the frond is soft and delicate, its form lanceolate and pinnate: the pinnæ are very numerous, elongate, linear, distinct, often distant, drooping, and pinnate; the pinnules are blunt at the apex, auricled at the base, distinctly stalked and serrated at the edges, and each serrature is armed with a spine: every part of the under surface of the fronds, more especially the primary and secondary rachides, abounds in reddish chaffy scales.

When we select a specimen of this plant in its extreme state, and contrast it with a specimen of P. aculeatum, also in its extreme state; when we select a central pinna of each, and

lay them before us side by side, on a sheet of paper, the difference is so striking, that were our observations allowed no wider range, we must exercise much sophistry in inducing even ourselves to suppose them identical. The *distinctly stalked pinnules* of angulare (fig. *a*), set on the stem at a more obtuse angle than that of the *decurrent pinnules* of aculeatum (fig. *b*), offer instantly a character which it is impossible to resist: and this, added to the discrepancy in the habit, texture, and figure of the frond, must lead an observer to believe them distinct. It is, however, from the constant occurrence of plants intermediate in habit, texture, figure and cutting, that the difficulty has arisen.

Varieties.

Of this species, or variety, whichever may be the correct title, there are two most beautiful and remarkable forms; indeed, these are so distinct, and the intermediate states so rare, that they might claim a rank at least equal to that of the fern under which I have placed them, were it not that their rare occurrence, and the proximity of abundance of the usual form of angulare, induces the conclusion that the variations are merely accidental. The first of these has the stipes of nearly equal length with the frond, and very sparingly clothed with scales: the figure of the frond is elongate-triangular, the lower pair of pinnæ being the longest. The entire frond is nearly without scales: its texture is leathery, but, in habit, as well as in the form of the pinnules, it agrees very closely with the normal form of angulare. I found two or three roots in Herefordshire, and Mr. Jenner has presented me with a frond gathered in Sussex. The second variety is still more remarkable. A specimen, for which I am indebted to the kindness of Mr. Pamplin, has above twenty pairs of pinnæ, of equal length: these are gracefully curved and pendulous at the extremities, the pinnules very slender and rather distant, and the auricled portion at the base of each is completely divided to the midrib: both the pinnule, and the lobe or auricle, terminate in a very acute point: the whole is densely chaffy. I believe this plant is very familiar to cultivators. The specimen given to me by

Mr. Pamplin was from a plant cultivated by Mr. Choules, formerly gardener to Lady Guildford; it was found in a hedge near Wimbledon, and is preserved in the Royal Botanic Garden, at Kew; and I possess a second, from Mr. Wollaston, gathered by himself near Ambleside. My notice of the slender pinnules of this plant has induced cultivators to call it "angustatum." A third form has been found in Ireland by my kind correspondent, Mr. Kinahan, whose unbounded zeal in the cause of Natural History is exhibited in every report of the Proceedings of the Dublin Natural-History Society. In this strange and most abnormal form, the fronds are of small size, and all the divisions atrophied or setiform.

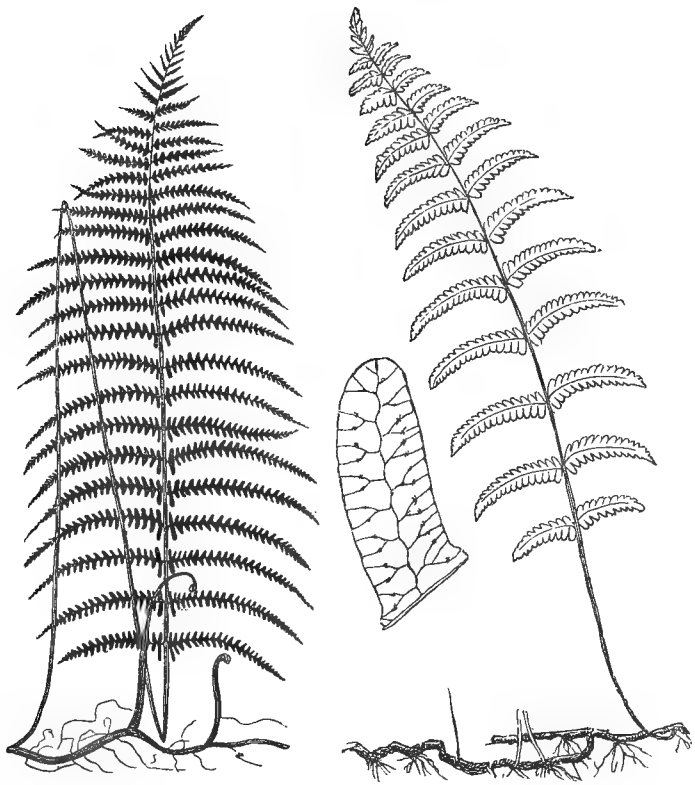
It is by no means uncommon for the slender pinnules of this fern to become much subdivided: an extreme instance of this is shown on the opposite page, in the figure of a pinna obligingly sent me by the late Mr. S. Gibson, of Hebden Bridge. From this meagre description, and the accompanying figure, cultivators have called the form "subtripinnatum."

There is a property possessed by this fern, which is common to many exotic, although I think not to any other British species: I allude to the production of new plants from bulbillæ which originate from the main or partial rachides at the axillæ of the pinnæ or pinnules: this state of the plant was fully described by Mr. Kinahan under the name of "viviparum," in a paper read before the Dublin Natural-History Society, in June, 1852; but was at that time very familiar to botanists residing near London, and Mr. Wollaston had called my attention to it long previously to the report of Mr. Kinahan's paper. I am indebted both to Mr. Wollaston and Dr. Allchin for specimens beautifully illustrating this interesting character. The bulbs are at first almost hidden in the profusion of chaffy scales with which the species abounds, but soon throw out small circinate fronds from their crown, and filiform radicles from their base, which, stretching downwards, try to reach the earth. Taken off in this state, and planted in any light soil, they grow with rapidity, and soon form good strong plants, which possess all the characters of the parents, however abnormal.

Culture of the Prickly Ferns.

These are the most easily cultivated of ferns. They are so much at home in our lanes and hedge-rows, that their transplantation to a garden is always attended with success; and

nothing can be more beautiful than their appearance. They even defy the impurities of the London suburban atmosphere, and exist for many years without any other care than an occasional watering. In the greenhouse they thrive still better, and it is almost impossible to conceive anything more elegant and delicate than the tracery of some of the more divided forms of angulare. The more divided the frond, the less durable: for whilst the leathery, rigid, and scarcely bipinnate form commonly known as "lobatum" shows no symptoms of decay until the end of the second year, the delicate and feathery plant called "angulare," decays at its base during the first winter, and, falling to the ground, soon becomes entirely destroyed. All the forms delight in soil chiefly composed of yellow loam.



MARSH FERN, (*one-ninth the natural size*).

Characters.

Genus.—HEMESTHEUM. Midvein of pinnules distinct; lateral veins alternate, always forked soon after leaving the midvein, and both branches running in parallel lines to the margin: each bears a cluster of capsules near the fork, and these being equidistant from the midvein and the margin, form two continuous series, which are concealed by the convolute margin of the pinnule: involucre minute, indistinct, subreniform, evanescent: each first upper and first lower pinnule

slightly longer than the second and following pinnules: ultimate divisions without a point.

Species.—THELYPTERIS. Caudex a creeping rhizome: fronds of two kinds, both erect, on long, smooth stipes, lanceolate, pinnate: pinnæ pinnatifid, lower pinnæ scarcely equalling the rest in length: pinnules blunt, entire, in fertile fronds with convolute margins covering the capsules.

Synonymes, Figures, &c.

Acrostichum Thelypteris, *Linn. Sp. Pl.* 1528; *Bolt. Fil. Brit.* part ii. 78, t. 43, 44; *With. Bot. Arr. Veg.* 649.

Polypodium Thelypteris, *Linn. Mant.* 505; *Huds. Fl. Ang.* 457; *With. Arr.* 776.

Polystichum Thelypteris, *Roth, Fl. Germ.* iii. 77.

Aspidium Thelypteris (*Swartz*), *Sm. E. F.* iv. 285; *Mack. Fl. Hib.* 340; *Franc.* 35; *Hook. and Arn.* 569.

Lastrea Thelypteris, *Bory, Dict. Class. d'Hist. Nat.* vi. 588; *Newm. N. A.* 19, *F.* 183; *Bab.* 409; *Moore*, 98.

Thelypteris palustris, *Schott. Fil.*

Hemestheum Thelypteris, *Newm. Phytol. App.* xxii.

It is rather a remarkable fact in connexion with the history of this fern, that it has never been represented in 'English Botany,' the figure which bears its name (Eng. Bot. 1018) being, as already stated, evidently drawn from a specimen of Gymnocarpium Phegopteris. Bolton made a somewhat similar mistake, by figuring Lastrea Oreopteris in its stead, (Fil. tab. 22); but this he subsequently rectified, by repeating the species under its proper name, (Id. tab. 43): his second figure is a very good one.

Botanists seem unusually at variance as to the genus in which this fern should be placed. Linneus, Bolton, Withering, Hudson, and many others, made it an Acrostichum; then all converted it into a Polypodium. Sir J. E. Smith, Sadler, Hooker and Arnott, and many others, make it an Aspidium Roth, DeCandolle, Godet, Koch, Ledebour, and many others, a Polystichum; Bory, Presl, John Smith, Babington, and many others, a Lastrea: a list of contrarieties that might readily be increased ten-fold, but which is sufficient to show that

a genus of ferns is a perfectly arbitrary assemblage of species. Schott was the first to propose a more restricted genus, under the name of Thelypteris; and I should unhesitatingly have adopted it, had I not an insuperable objection to change a Linnean specific name, a course that would be necessitated by the transference of that name to a genus. This fern is an admirable example of the present state of fern-classification: nothing could possibly exhibit more clearly its chaotic state.

Geographical Range.

This species occurs in every country in Europe, and in Asiatic Russia: it is said by Sadler to occur also in North Africa, and in North and South America; North America I can confirm, being indebted to Mr. Boott for both fronds and living plants from the United States, which are so similar to our British plant that I am unable to detect any character by which to distinguish them.

In this country it must be considered local, but its distribution is very general. It occurs only on those boggy heaths where the soil is so moist and light that its rhizome can extend itself with rapidity and freedom: in such situations it is found in great abundance. The list of localities which I have received through the kindness of correspondents, is far too voluminous to publish; I shall therefore only give a general summary, from which it will be observed that as regards the English and Welch counties, it occupies tracts that are avoided by the ferns of mountainous regions.

In Scotland it is a fern of excessive rarity: some of the few localities which have reached me have turned out on investigation to have originated in an error, a small frond of Lastrea montana having been mistaken for the present plant. Through the kindness of Scotch botanists, I have received very careful lists of the ferns of Argyleshire, Dumbartonshire, Dumfriesshire, Kirkcudbrightshire, Lanarkshire and Renfrewshire, and from all of these it is absent. I am indebted to Mr. Watson for the information of its occurrence in Forfarshire, on the authority of Mr. R. Maughan; Mr. Watson adds, "not in fruit, but I believe the name correct." Again, in 'Cybele Britannica' (iii. 265), he speaks of having a specimen from Mr. Maughan in his own herbarium.

In England it has been recorded for the following counties: — In Northumberland, Mr. Embleton has found it plentifully in Learmouth bogs. In Westmoreland, the Rev. Mr. Pinder found it in Hammersham bog. In Yorkshire, Mr. Hardy finds it at Potterie Car; Mr. Bean at Scarborough; Mr. S. Thompson, at Askham bog, also near York: Heslington fields, Terrington Scar, and several other localities, are mentioned by my correspondents. In Cumberland, it occurs at Glencoin, Blowike, Ulswater, and Keswick, as recorded in the 'Botanist's Guide.' In Cheshire it is a fern of common occurrence: Harnicroft wood, near Wernith, is recorded in the 'Botanist's Guide;' Mr. Wilson, of Warrington, has found it in Newchurch bog, near Over, on Knutsford Moor, and on Rostherne Moor. In Nottinghamshire, it is abundant in Oxton bogs and in Bulwell bogs; in the first it was found by Dr. Howitt, and in both by Mr. Sidebotham. In Shropshire, my very kind and trustworthy friend, Mr. T. Westcombe, tells me he has found it at Berrington pool. In Warwickshire it was formerly found by the Rev. W. T. Bree near Allesley; subsequently supposed to have become extinct on account of the draining of the bog (see Mag. Nat. Hist. v. 199), but recently discovered in luxuriant profusion by Mr. W. G. Perry; the swamp is indicated on the Ordnance Map by a faint nebulous mark, it is four miles N.N.W. of Warwick, half a mile N. of Goodrest Lodge, and within a few yards of Roundsel lane, (see Phytol. iv. 1135). In Norfolk it is common in all the fen country,—Horning Marshes, St. Faith's, Upton Fen, Filby Broad, Holt Edgefield, Scaring Fen, and Felthorpe Fen; I am indebted to correspondents for the sight of examples from many of these localities, and all of them have, I believe, been recorded by Mr. S. P. Woodward: "This fern grows in the greatest abundance in all the swampy uncultivated ground on the bank of the river below Norwich," — Rev. W. S. Hore, in Phytol. iv. 95. In Suffolk, Mr. Stock finds it near Bungay; and Lound Hipton and Brodwell Common are given as localities in the 'Botanist's Guide.' In Cambridgeshire, Mr. Relhan records the following stations: — "Fulbourne, by the foot-path to the mill, on both sides; Teversham Moors; Gamlingay." In Bedfordshire, Potton Marshes are recorded in the 'Botanist's Guide.' In Essex, I have seen it growing at Epping, where it was discovered by Mr. John Ray, a lineal descendant of the immortal botanist; and the late Mr. E. Forster found it growing abundantly on Baddow Common. In Kent, my kind friend, Mr. Ward, found it on the borders of Ham Ponds, near Sandwich, and Mr. Kippist subsequently in the same locality; and Mr. H. L. Jenner, Mr. Sparkes, the late Mr. Peete, the late Mr. W. Christy, and many others, have observed it at North Cray. In Surrey, Mr. Salmon finds it in a single station called Hurtmore Bottom, near Godalming, and many botanists have gathered it round the base of Leith Hill, where it was originally observed by Mr. Borrer. In Sussex, it occurs frequently in

what is called the "forest district:" Albourne and Amberley are recorded as stations on the authority of Mr. Borrer; Tunbridge Wells, on that of Mr. Jenner (and since verified by myself); Waterdown Forest, on that of Mr. Pamplin; and Ore, near Hastings, by Mr. Woods: I have seen specimens from all the Sussex stations. In Hampshire, it occurs in a single station called Freshwater Gate, in the Isle of Wight, where, I believe, it was discovered by the late truly estimable Dr. Bromfield; and also "in one small spot near the city of Winchester," (Mr. R. Smith, in Phytol. iv. 276). In Somersetshire, my friend, Mr. Thomas Clark, has observed it covering thousands of acres on Turf Moor, between Bridgewater and Glastonbury; Mr. T. B. Flower gives similar information; and Mr. T. Westcombe also found it in abundance on Turf Moor, near Street, in this county: all these records probably refer to one locality.

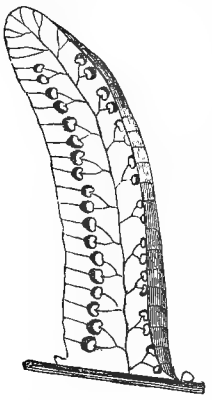
In Wales, it is recorded for three counties:—Llanberis, in Caernarvonshire; Llwydiard lake, Pentraith, in Anglesea; and Cwmbola and Sketty bogs in Glamorganshire. I have not seen the specimens.

In Ireland it seems equally uncommon. Through the kindness of the late Mr. W. Thompson, I have received the following extract from the MSS. of the late Mr. Templeton respecting this fern:—"Plentiful among woods and bushes in the low part of Portmore Park, on the side of Lough Neath, county Antrim." Mr. Moore informs me he has subsequently found it on the same spot. "Near Lough Carra, county Mayo," Mr. J. Ball. "A marsh near Mucruss," Mr. Mackay. Captain Jones informs me he subsequently found it at this station, but several botanists have lately sought diligently without success.

Description.

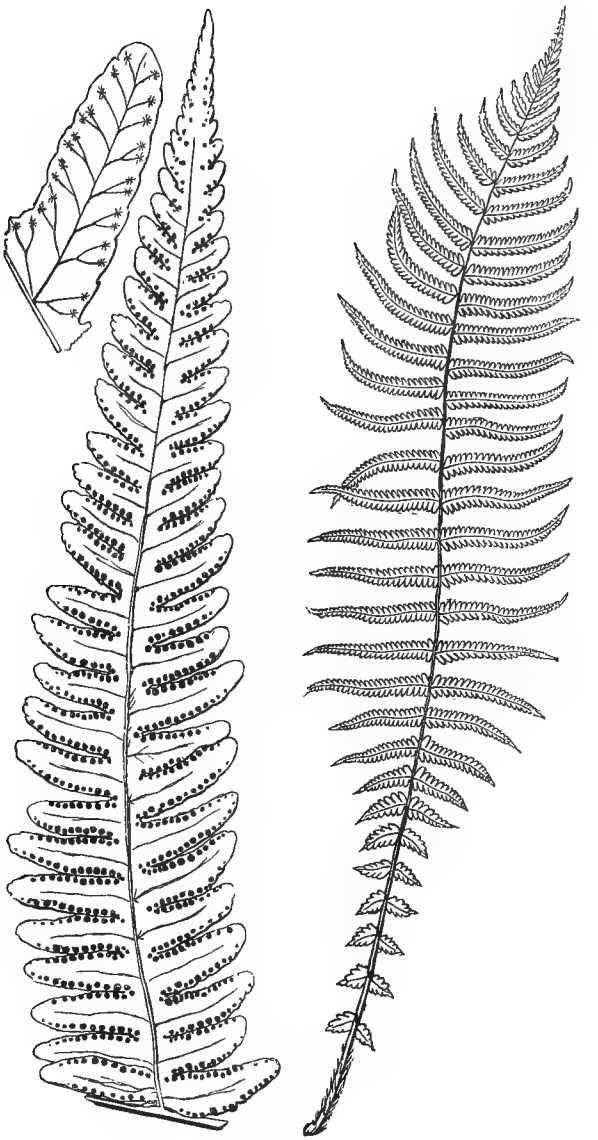
The radicles are black and fibrous; the caudex a slender but very tough rhizome, black, and rapidly creeping. The fronds are of two kinds, barren and fertile; the barren appear in May, the fertile in July: the pinnules of the young frond stand out at right angles with the rachis. The stipes of the barren frond is long, smooth, and erect; the frond lanceolate and pinnate: the lowermost pinnæ are rather shorter than the second, third, or fourth pairs, still not materially shorter, and always situate a long distance from the base of the stipes: the pinnæ are generally nearly opposite, distant, linear, slightly drooping, and pinnatifid; the pinnules crowded, adnate, entire and rounded at the extremity: the habit is slender, delicate,

and very fragile; the texture thin and almost membranaceous; the colour pale green. The fertile frond differs in being much more tall and robust, and in having the margins of the pinnules convolute, and the pinnules themselves are thus rendered narrower, and apparently more distant. The lateral veins of the pinnules are alternate; they are forked almost immediately on leaving the midvein, and each branch proceeds to the margin of the pinnule (as shown at page 123), bearing a nearly circular cluster of capsules about midway between the midvein and margin: at the back of each cluster, in an early stage of the frond, may be seen a small, flat, whitish, reniform involucre, as represented in the figure in the margin; this soon withers, is pushed aside by the swelling capsules, and is lost: the clusters of capsules become confluent, and are always concealed by the semi-bleached semi-membranous margin of the pinnule.



Culture.

This fern grows freely, provided the soil be sufficiently peaty and the supply of moisture abundant: if this can be done in no other way, it may always be accomplished by digging out the ordinary soil, and making a cemented bottom upon which to spread the peat: saturate this thoroughly with water; too much cannot be given, as the rhizomes will thrive equally well when constantly submerged. For greenhouse cultivation, use the largest obtainable seed-pan without any aperture for the escape of water: sift peat-earth through a coarse sieve, and mix it with charcoal broken small, in the proportion of seven parts peat to one of charcoal: arrange the rhizomes among this compost and saturate with water: no protection against sun is required.



MOUNTAIN FERN, (*the pinna a shows the natural size*).

Characters.

Genus. — Lastrea. Caudex tufted, its crown composed of undeveloped fronds standing above the surface: midveins of pinnules distinct; lateral veins alternate, sometimes once forked, but not uniformly; each bears a circular mass of capsules near, but not at, its extremity.

Species. — Montana. Caudex tufted: stipes very short, almost wanting, chaffy: frond semierect, lanceolate, much attenuated at the base, pinnate: pinnæ pinnatifid, divisions rounded; lower pinnæ very short, deltoid, obtuse.

Synonymes, Figures, &c.

Polypodium fragrans, *Linn. Mant.* ii. 307; *Huds. Fl. Ang.* 457, (2nd edition).

Polypodium montanum, *Vogler, Diss. de Pol. mont.*; "*Willd. Berol.* 291"; *Roth, Flor. Germ.* p. 447, No. 4.

Polypodium pterioides, *Vill. Hist. Pl. Dauph.* iii. 841.

Polypodium limbospermum, *Bell. Act. Taur.* v. 253.

Polypodium Oreopteris, *Ehrh. Beitr.; Dicks. Tr. Linn. Soc.* i. 181; *With. Arr.* 775.

Polipodium Thelypteris, *Bolt. Fil. Brit.* 40, t. 22.

Polystichum montanum, *Roth, Flor. Germ.* iii. 74.

Aspidium Oreopteris (*Swartz*), *Sm. E. F.* iv. 286, *E. B.* 1019; *Mack. Fl. Hib.* 339; *Hook. and Arn.* 569.

Lastrea Oreopteris, *Bory, Dict. Class. d'Hist. Nat.* vi. 588; *Newm. N. A.* 17, *F.* 187; *Bab.* 410.

Hemestheum montanum, *Newm. Phytol. App.* xxii.

The figures of this fern are generally good: that in Bolton, which I have quoted above as bearing the name of the preceding species, is excellent.

This fern has received six specific names, besides that of Thelypteris erroneously assigned to it: it is the Polypodium montanum of Vogler, and subsequently the Polystichum montanum of Roth, the Polypodium Oreopteris of Ehrhart and Dickson, the Polypodium fragrans of the second, but not of the

first, edition of Hudson's 'Flora Anglica,' the Polypodium pterioides of Villars, the Polypodium limbospermum of Bellardi, and the Aspidium odoriferum of Gray's 'Natural Arrangement of British Plants.' The earliest of these six names is montanum; and although reluctant to exchange a name so generally received as Oreopteris, for one so seldom employed as montanum, I think there is really no choice, especially as the older name has been advisedly adopted by the most precise and painstaking of German botanists.

The genus Lastrea was established by Bory in the year 1824. That learned author placed the present species as its type, the minute, fugitive, and inconstant involucre having entirely escaped his notice, as appears from the following passage in his definition of the genus: — "Sa fructification consiste en sores *parfaitement nues*, c'est à dire *dépourvues d'induse quelconque*." Presl transferred the name of Lastrea to such species as Filix-mas, with this altered character: — "Indusium reniforme sinu affixum:" and Mr. J. Smith, Mr. Babington, and others, have followed him. The time has arrived to correct this mistake, and if we accept the genus Lastrea, which Robert Brown has pronounced strictly natural (see 'Plantæ Javanicæ Rariores,' p. 4), we must accept also the type-species as our guide, and exclude such species as were advisedly and designedly excluded by its author.

Geographical Range.

Lastrea montana grows throughout Europe, but, according to Sadler, is confined to that continent, and I have seen it from no other part of the world: in one or two instances it has been confounded, though very injudiciously, with the beautiful Novaboracensis of the United States, a perfectly distinct species, and closely related to Hemestheum Thelypteris.

In many of its characters this fern is so like the last, that it is constantly taken for it, a circumstance which has led to a profusion of errors respecting localities.

In Britain, this fern is an inhabitant of mountainous districts; it is more rarely found on low ground, and very seldom in highly cultivated counties. It is particularly abundant in

the Highlands of Scotland, being, in many of the mountain wilds, more common than Eupteris aquilina: it also abounds in the hill districts of the North of England and Wales. It is not, however, confined to hills, since we find it sparingly in all our counties where there is waste ground: it approaches London on all sides, occurring on Wimbledon Common, Hampstead Heath, High Beech, and Blackheath. Notwithstanding its apparent partiality for exposed and elevated districts, it grows more beautifully and luxuriantly in woods, especially where they are intersected by a little stream, on the banks of which it will often be observed in profusion. At Houndsdown Bottom, near Hindhead, in Surrey, it is particularly abundant and luxuriant; and the same is the case in Eridge Woods, near Tunbridge Wells.

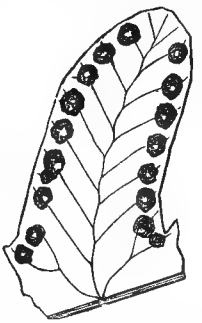
In Ireland it is very sparingly distributed: I only observed it in abundance in two spots, — near Milroy Bay in the county Donegal, and near Glendalough in the county Wicklow. It occurs sparingly in the Killarney district: Mr. Moore has observed it in the county of Londonderry, and Mr. E. T. Bennett in the county Clare, by the roadside between Innistymon and Corrafin; and in the county Galway, between Dooghty and Ma'am; plentifully on the ascent of Ma'am Turc pass from the Ma'am Hotel; and near Letterfrank.

Description.

The radicles of this fern are numerous, strong, tough, and penetrating; they appear to spread in every direction from a large, scaly, tufted caudex, which yearly increases in magnitude. In favourable situations, this sends forth thirty or forty fronds, which spread with but little regularity round a common centre: immediately these begin to unrol they exhibit the pinnæ, placed at right angles with the main rachis, and are not convolute, a character worthy of particular notice, because unusual. The fronds, when fully expanded, are very variable in size, dependant chiefly on situation, but also in a great measure on the age of the plant. An extraordinary number of seedlings are met with where this fern is abundant: these, for two or three years, bear little or no fruit, but after the third year fructification

appears in abundance, and from that period all the fronds are fertile. In the form of the frond there is little or no variation; it is elongate-lanceolate, and regularly pinnate: pinnæ acute at the apex, and gradually diminishing from about two-thirds of its length to the very base, the lower pinnæ being remarkably short, and nearly triangular in form: this attenuation of the frond towards the base is an excellent diagnostic (see figure *b*, page 129), and is of itself sufficient to distinguish the present from any other British fern. There is but a very small portion of stipes below the pinnæ, and this is nearly hidden by pale brown scales. The pinnæ are linear and acute at the apex, rather distant, deeply pinnatifid, and attached to the main rachis only by their midrib: a separate pinna is represented of the natural size at *a*, page 129. The pinnules are rounded and slightly crenate: over the entire under surface are scattered small, yellowish, glandular globules, which are adhesive to the touch, and emit a powerful but not very agreeable odour: it is probably in consequence of this property that the species was originally named Polypodium fragrans by Linneus.

The veins in the pinnules of Lastrea montana are alternate, and are either simple or branched: in the latter case both veins are fruitful, as in Hemestheum Thelypteris. Sometimes the veins or branches are again divided just before their termination, and then each of the subdivisions is usually fruitful: all the veins and branches cease just before the margin of the pinnule: the clusters of capsules are circular, and are placed very near the extremity of each vein, so as form a nearly marginal series. In some instances, but by no means generally, a small, torn, white involucre is to be seen near the centre of each cluster of capsules, as represented in the margin. This involucre is said to be reniform, a character I have never been able to detect: in general the masses are perfectly naked, and even before the frond has unrolled this absence of an involucre is equally manifest; a circumstance worthy of notice, as showing that its frequent absence is a character, and not the result of age or accident.



Varieties.

Sir J. E. Smith makes a variety β. of Ray's "F. pumila saxatilis altera Clusii," which seems to be nothing more than the ordinary seedling form of the species.

Culture.

Plant this fern in yellow loam, without any admixture of other soil. It succeeds best in the open air, but will also thrive in a cool and thoroughly ventilated greenhouse, provided the pot stand constantly in water.

BREE'S FERN, (*one-fourth the natural size*).

Characters.

Genus.—Lophodium. Caudex large, massive, and persistent, increasing by slow and almost imperceptible degrees, generally erect, but sometimes prostrate, its growing extremity always composed of a most obvious crown of undeveloped fronds: fronds with the first upper pinnule somewhat larger than the second, and notably less than the first lower pinnule: all the ultimate divisions of the frond terminating in a short spine, or mucronato-serrate: midvein of ultimate divisions always distinct; lateral veins once or twice forked, each branch running towards a spine, but always ceasing before reaching it: clusters of capsules borne on the anterior branch of each divided vein, and situated half-way between its base and extremity: involucre small, not covering the capsules, subreniform, placed obliquely to the plane of the pinnule, attached at an emargination, which is placed towards the base of the capsuliferous vein, and directing its free margin in a contrary direction.

Species.—Fœnisecii. Caudex tufted, large, crown unusually broad: stipes as long as the frond, woody, clothed with long, narrow, sometimes laciniated scales: frond strictly evergreen, elongate-triangular, drooping, elegant, pale delicate green when young, its under surface sprinkled over with sessile, pellucid glands, pinnate: lowest pair of pinnæ longest, stipitate, all the pinnæ pinnate: all the ultimate divisions of the frond concave, but the entire frond, as well as each pinna, convex: involucre jagged, without *stalked* glands: clusters of capsules round, distributed over every part of the frond.

Synonymes, Figures, &c.

Filix alpina Myrrhidis facie Cambrobritannica, *Pluk. Alm.* 155, *Phyt.* tab. 89, f. 4.

Filix montana ramosa minor argutè denticulata, *Ray, Syn.* 27. 1690. Edit. 3, p. 124. 1724.

"Polypodium rhæticum, Huds. 458, according to the Banksian Herbarium," *Sm.*

"Polypodium cristatum, β. Huds. ed. 1, 390," *Sm.*

?? Aspidium dumetorum, *Sm. E. F.* iv. 294. 1828. (The reference is suggested by the synonymes and localities).
Nephrodium fœnisecii, *Lowe, Camb. Phil. Trans.* iv. 7. 1832.
Aspidium dilatatum, *var.* recurvum, *Bree, Mag. Nat. Hist.* iv. 162. 1831.
Aspidium recurvum, *Bree, Phytol.* i. 773. 1843.
Lastrea recurva, *Newm. N. A.* 23, *F.* 225. 1841.
Lastrea fœnisecii, *Watson, Phytol.* ii. 568. 1846. *Bab.* 411. 1851. *Moore*, 132, (excl. the figure). 1853.
Aspidium spinulosum, γ. *Hook. and Arn.* 571. 1850.
Lophodium recurvum, *Newm. Phytol.* iv. 371. 1851.
Lophodium fœnisecii, *Newm. Phytol. App.* xvi. 1851.

The figure in Plukenet is very good, so far as outline and division are concerned, but the convexity of the major, and the concavity of the minor divisions, is of necessity omitted.

The earliest notices of this fern are in Ray's 'Synopsis,' before quoted (p. 100 of this work), and in Plukenet's 'Almagestum,' also cited. An interesting addition to Ray's original description appears in the 3rd edition of the 'Synopsis,' as follows:— "Viviradices prope Phainon Vellon quondam eradicavi, quæ jam in horto nostro vigent. Loco natali planta est admodum rara; *Dr. Richardson.*" Sir J. E. Smith assigns both Ray's and Plukenet's synonymes to his Aspidium dumetorum, but neither his description, nor his specimens now in the herbarium of the Linnean Society, at all bear out this view. In 1831 the Rev. W. T. Bree described the plant in Loudon's 'Magazine of Natural History,' as Aspidium dilatatum, *var.* recurvum. Subsequently, in 1832, the Rev. Mr. Lowe described the species in the Cambridge 'Philosophical Transactions,' as an inhabitant of Madeira, under the name of Nephrodium fœnisecii: and in 1843, Mr. Bree expressed his opinion in the 'Phytologist' that it was a distinct species, and proposed to call it Aspidium recurvum. In 1841, it was described as Lastrea recurva in the 'British Ferns.' In 1846, Mr. Watson pointed out to me that the fœnisecii of Lowe and the recurva of Bree are identical; and in the 'Phytologist' for the same year, that eminent botanist named the plant Lastrea fœnisecii. In 1850, the learned authors of the 'British Flora,' in a long and elaborate foot-note to their Aspidium spinulosum, assign their reasons for considering this fern a form of that species. In 1851, I

redescribed the plant in the Appendix to the 'Phytologist' under the name of Lophodium fœnisecii, convinced that it could not be botanically associated with the species placed as typical by the original describers of the genera Aspidium, Nephrodium or Lastrea. Such is a concise summary of the botanical history of this truly beautiful, and, to me, most interesting fern.

In my list of synonymes I give references to all the authors whom I believe to have noticed it, omitting, however, a great number of papers in different volumes of the 'Phytologist,' which dwell principally on the propriety or impropriety of the name. Mr. Moore's description certainly refers to the plant under consideration; but I fear his artist has made some mistake about the figure, which as certainly does not represent the deltoid outline of fœnisecii.

Geographical Range.

In the Azores, Madeira, the Cape de Verde and Canary Islands, Lophodium fœnisecii appears to be a common fern.

In Britain, its distribution is not in accordance with any general law of fern-geography. It appears to have landed, from the Atlantic, on the south-western points of England and Ireland, and to have made itself perfectly at home: it is profusely abundant in Cornwall, Cork, and Kerry; it spreads northward and eastward from each of these, its great strongholds, and also appears here and there in detached and distant localities. It grows amidst grass in exposed and rocky situations, and also abounds in warm and sheltered woods, especially in the vicinity of water-courses; the latter appears its natural habitat, since in the former situation it is dwarf, less copiously fruited, and appears altogether less healthy and vigorous. I am compelled to neglect many communications which possibly refer to this species, because I find the plant so imperfectly known. In almost every locality mentioned, I have either seen the plant growing, or possess specimens therefrom: when this is not the case, I give the information in parentheses, not from any doubt of the veracity of the information, but because I feel certain that the species is still imperfectly known. It must therefore by no means be presumed that I suppose the range

confined to the few counties I have mentioned; but these are the only habitats for the accuracy of which I am enabled to vouch from actual observation.

In SCOTLAND it is certainly a rare fern, but the following localities may be recorded: — (Hoy Hill, Orkney; Mr. Anderson). Isle of Mull; Mr. W. Tanner, to whom I am indebted for a specimen. (Isle of Arran; Dr. Balfour). Shore of Loch Lomond; a lady, who has obligingly sent me a specimen. (Forfarshire; the late Mr. Gardiner).

ENGLAND and WALES. — (Northumberland; Mr. Embleton: "Rocks in the dean below Marshall-meadows; and from Dirrington Law;"— 'Terra Lindisfarnensis,' p. 248. I think the learned author, in calling it a "reputed species," and using other similar expressions, implies that he is not at home with this odoriferous plant). Cumberland; I am indebted to Mr. Pinder for specimens gathered near St. Bees Head, in this county: and through the kindness of other correspondents, I have seen many specimens from the coast of the county. Yorkshire; I am indebted to Mr. Bean for beautiful specimens gathered near Scarborough, and to my kind friend, Mr. Tatham, for others from near Settle. Descending southward, it appears again in North Wales: Dr. Allchin, and several other botanists, have gathered it in the Snowdon district; and I possess a specimen from the very spot where it was first found by Mr. Lloyd: Mr. Maw has lately found it on Holyhead mountain in abundance, and has kindly shown me his specimens, some of which exactly resemble Plukenet's elegant figure: and Mr. Edward Young has found it at Melincourt Waterfall, in Glamorganshire, but nowhere else in the Vale of Neath, which he has thoroughly searched. (Somersetshire; the Rev. W. H. Coleman). Devonshire; the Rev. W. S. Hore, whose specimens I have not seen, but who is well acquainted with the species, has found it in great abundance around Clovelly, in this county, extending nearly to Helsworthy, which is about ten miles inland (see Phytol. iv. 96). In Cornwall it has been observed by so many botanists that I can scarcely enumerate them: from the Rev. W. S. Hore, the Rev. C. A. Johns, the Rev. W. T. Bree, Mr. Ralfs, Mr. R. Watson, Mr. T. Westcombe, the late Mr. Alfred Greenwood, Mr. W. Bennett, and a number of others, I have received specimens or localities; indeed, it seems to be the most common fern in this maritime county. Sussex; I am indebted to Mr. Bree for a specimen procured by Mr. Dickson from this county; and to Mr. E. Jenner, of Lewes, for several others, gathered at Eridge Rocks, Tunbridge Wells: Mr. Jenner had also the kindness to conduct me to the spot where it abounds, and thus afforded me the pleasure of examining the plant in every stage while yet growing; I found that every character seemed to justify the opinion I had formed in Ireland four years previously, of its being perfectly distinct as a species: Mr. Luxford has found

the same plant upon the moist wooded slope opposite the rocks at West Hoathly; and, conducted by my friend, Mr. John Hutchinson, I visited this locality in August, 1853, and found it, not only there, but in other neighbouring localities.

Ireland.—Antrim; I first saw this beautiful fern growing luxuriantly below the basaltic cliffs at Fair Head. Londonderry; near Coleraine, near Rushbrook, in several localities near Garvagh, and near Londonderry. Donegal; several places on the banks of Lough Swilly, Milroy Bay, Arrigal Hill, near Donegal, and about Lough Derg. Sligo; among limestone rocks on the approach to Sligo from Manorhamilton. Mayo; foot of Nephin, Coraan Achill, Newport, Westport, &c. Galway; about Clifden, about Roundstone and Ballinahinch, and near Oughterard. Clare; near Loop Head. Kerry; on all the mountains and in all the woods: in the neighbourhood of Killarney it is so conspicuous an object as to have excited the admiration of many botanists. Mr. Ogilby, of Dublin, writes thus:—"This is, in my opinion, the most beautiful of our robust ferns: in style of growth and elegance of form it is most striking; it presents two tiers of fronds, if I may so describe them, the lower more pendulous, the upper more erect, and it is on the more erect fronds that the fructification is most perfectly developed: the dark purple stem contrasting with the light green and crisped appearance of the pinnæ gives a peculiarly elegant feature to the plant: it likes the seclusion of trees, and places where it is not pressed by other vegetation; on spots about Dinis Island, and more particularly under Cromaglaun mountain, it may be seen fully developing all its loveliness." At O'Sullivan's Cascade, in the same neighbourhood, I observed it in the most graceful and beautiful luxuriance; it forms a chief ornament of that exquisite little waterfall. I am indebted to Mr. Ogilby and Mr. S. P. Woodward, for specimens from the vicinity of Killarney; and to the late Dr. Taylor, of Dunkerron Castle, for others from the neighbourhood of Kenmare. Cork; I found it in profusion in the woods about Glengarriff, and am indebted to Mr. Woodward for a specimen gathered in the vicinity of Cork. Waterford; I saw fœuisecii in several places in this county without intentionally searching after it. Wicklow; most abundant, beautiful, and luxuriant at Glendalough: it here occurs of every possible gradation of size; on the exposed and bare rocks it is very diminutive, but in the woods it attains a large size, and is equally beautiful with the specimens growing in the woods about Killarney.

Description.

The radicles are very strong, and penetrate the fissures of the Sussex rocks, on which this fern abounds, to a great depth,

so that they are difficult to extract, and are commonly broken in the attempt. The caudex is remarkably large, solid, and woody, its crown broad and circular, and the undeveloped fronds seem unusually numerous, and look like a mass of nodules crowded together. The fronds, on first rising from the earth, are regularly convolute, and when they exhibit the first symptoms of unfolding, the two lower pinnæ are very conspicuous, and their superior size is still more manifest than at a later period. When the frond is entirely unfolded, it is of an elongate-triangular form, of a very gracefully curved habit, and about equal in length to the stipes, which is dark purple in colour, very hard and woody in texture, and very long-enduring; it is clothed with narrow, elongate, laciniated, pointed, brown, concolorous scales, which, in luxuriant plants, are frequently so numerous and so divided as to give the stipes a woolly appearance : one of these scales is shown in the right hand figure at page 146. The frond is pinnate, and, as in all truly deltoid ferns, the lower pinnæ are notably larger and longer than the rest, and very distinctly stipitate. The pinnæ are pinnate, the pinnules pinnate, and the lobes again divided and serrated, and all the serratures terminate in short spines. The inferior pinnules are generally larger than the superior, and the first inferior pinnule of the lower pair of pinnæ is vastly superior to all the rest in magnitude. The colour of the young frond is a most lovely green, and all its ultimate divisions are concave, giving to the plant, especially when young and barren, a very peculiar and crisped appearance. The under surface of the frond is abundantly sprinkled over with minute, sessile, pellucid, globular, and, I presume, glandular bodies; a distinctive character of the species, and one for the knowledge of which I was first indebted to a kind communication from Lord Downe, then the Hon. W. H. Dawnay. These bodies, in all probability, emit the hay-like scent which induced Mr. Lowe to give the species the very appropriate name of "fœnisecii."

The clusters of capsules are circular, and are equally distributed over all the frond: they are partially covered by a slightly convex and somewhat reniform involucre, the margins of which are jagged and uneven, and are sometimes beset with a few of those globular, sessile glands which have been described as sprinkled generally over the under surface of the frond: this

character was first pointed out to me by Mr. Jenner, when we were examining the living plants at Eridge Rocks; and I am indebted to that gentleman for much kind assistance in my first endeavours to distinguish this species from its congeners.

My much-esteemed friend, Mr. Yarrell, first pointed out to me the fact, that the fronds of this fern wither, like those of Filix-fœmina, almost immediately on being gathered; but notwithstanding this peculiarity, we have no fern of which the fronds are more perfectly persistent: but this character again fails in the very fruitful fronds.

Varieties.

Mr. Lowe has described and named two varieties of this fern, as below: —

"*α. alatum;* fronde 4-pinnatifidâ; pinnis inferioribus (primi secundique ordinis) triangularibus vel ovatis, externis interioribus oppositis valdè majoribus: pari infimo pinnarum (primi ordinis) basi deorsum ramoso; pinnulâ (secundi ordinis) potissimùm prima (aliquando etiam secunda) inferiore s. exteriore deorsum productâ.

"Hab. in sylvis Vaccinii padifolii, *Sm.*, Maderæ; ubique vulgatissima.

"*β. productum;* fronde tripinnatifidâ, paullò magis elongatâ: pinnis omnibus oblongis; externis internis oppositis vix majoribus: laciniarum ultimarum dentibus subaristatis.

"Hab. in umbrosis humidioribus Maderæ; rariss.

"*β.* Statu potius prioris (*α.*), e loco obscuriore, defectu luminis, &c., quàm varietas videtur.

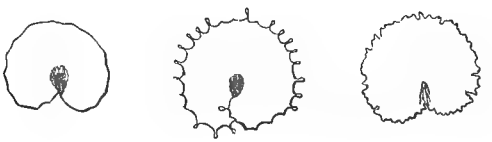
"Frons in utraque varietate nana, 1—1½ pedes (una cum stipite) longa, ferè pedalis; 6—8 pollices lata: stipite vix dimidium totius longitudinis æquante. In utraque odor idem gratissimus fœnum novum redolens, constans."—Phytol. iii. 510.

Both forms occur in Ireland, and in Cornwall, but it does not appear to me that they require naming, since the more elongate form appears constantly to grow among thick herbage, or in deep shade, and to owe its character to this cause: it is not so common, or indeed so normal, as the deltoid form.

Culture.

A most desirable fern, both for the garden and the greenhouse. It grows readily in the ordinary mixture of loam, peat, and sand, requires abundant watering, and enjoys shade. In the garden it should, if practicable, be placed on a rockery composed of sandstone: in a greenhouse it is the very best of our British species; its beautiful colour, elegant habit, truly evergreen character, and perfect hardiness, render it of unequalled value as a house fern. As it is a remarkably neat and compact plant, and never addicted to coarse or rambling growth, a number of roots may be planted together, and produce a very pleasing effect. Having first obtained a seed-pan of the largest size, cover the bottom with Sphagnum and charcoal, the latter in lumps as large as a hazel nut: then fill the pan to its rim with the compost, and having pressed this down, saturate with water: then having previously provided twenty or thirty small plants of the fern, and as many moderately-sized pieces of sandstone, build a conical pile above the soil already in the pan, intermixing stones and ferns, and filling the interstices firmly with the compost.

The figures below represent the involucres of three species of Lophodium: *a*, spinosum; *b*, multiflorum; *c*, fœnisecii.



a *b* *c*

PINDER'S FERN.

Characters.

Genus.—Lophodium. (See page 136).

Species. — Collinum. Caudex tufted; crown broad, dark-coloured: fronds symmetrically arranged round a centre, but not numerous: stipes notably shorter than the frond, clothed at the base with lanceolate scales, which are dark-coloured, with still darker apices: fronds pinnate: pinnæ pinnate: pinnules serrated, the teeth scarcely mucronate; under surface glandular: clusters of capsules scattered, rather small, distributed over the entire under surface: involucre jagged at the margin, and fringed more or less with stalked glands.

Synonymes, Figures, &c.

Lastrea multiflora, *var.* collina, *Newm. F.* 223.

Lastrea dilatata, *β.* collina, *Moore*, 123.

Lastrea collina, *Moore*, 128.

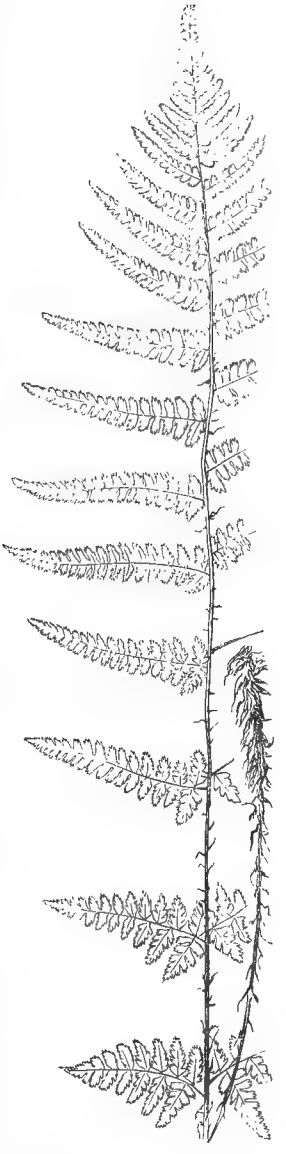
I think it possible, but extremely difficult to prove, that this plant is the Polypodium tanacetifolium of Hoffmann, in 'Deutschlands Flora,' ii. 8; and the Polystichum tanacetifolium of Lamarck and DeCandolle, 'Flore Française,' ii. 562.

Geographical Range.

Beyond the limits of Britain I know nothing of this fern.

In England, it occurs in the Lake district of Lancashire and Westmoreland, and in Yorkshire; and I am indebted to the Rev. Mr. Pinder, and to Miss Beever for specimens, and for all the information I possess respecting the species.

Description.



Radicles numerous, black: caudex tufted; crown rather broad, very dark-coloured, clothed with dark brown scales: stipes notably shorter than the frond, very green towards the frond, but dark purple below: the frond pinnate; pinnæ sublinear, acute, distant, generally spreading, being attached nearly at right angles with the rachis, pinnate: pinnules blunt, lobed, lobes serrated, teeth of the serratures broad, scarcely mucronate: under surface glandular: involucre jagged, fringed more or less with stalked glands.

Varieties.

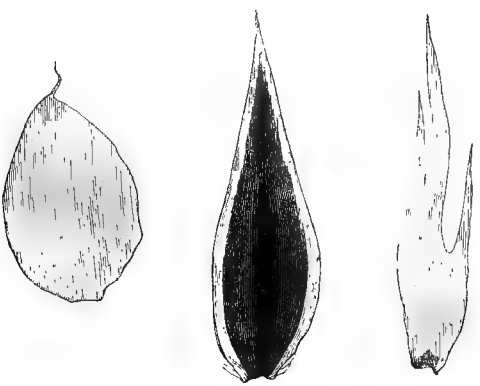
The form of this fern is exceedingly various, but I do not think I shall be justified in describing, much less in naming the varieties, which depend solely on the outline or circumscription of the frond. My examples, all agreeing in the blunted apices of the serratures, and in the character of the scales and glands, are more various in outline than all the other species of the genus: the extreme forms in one direction are regularly deltoid, and, in the other direction, narrow linear-lanceolate. I take the deltoid for the younger, and the lanceolate for the older plant: a root found by the Rev. Mr. Pinder near Chapel Styles, in Westmoreland, bearing fronds

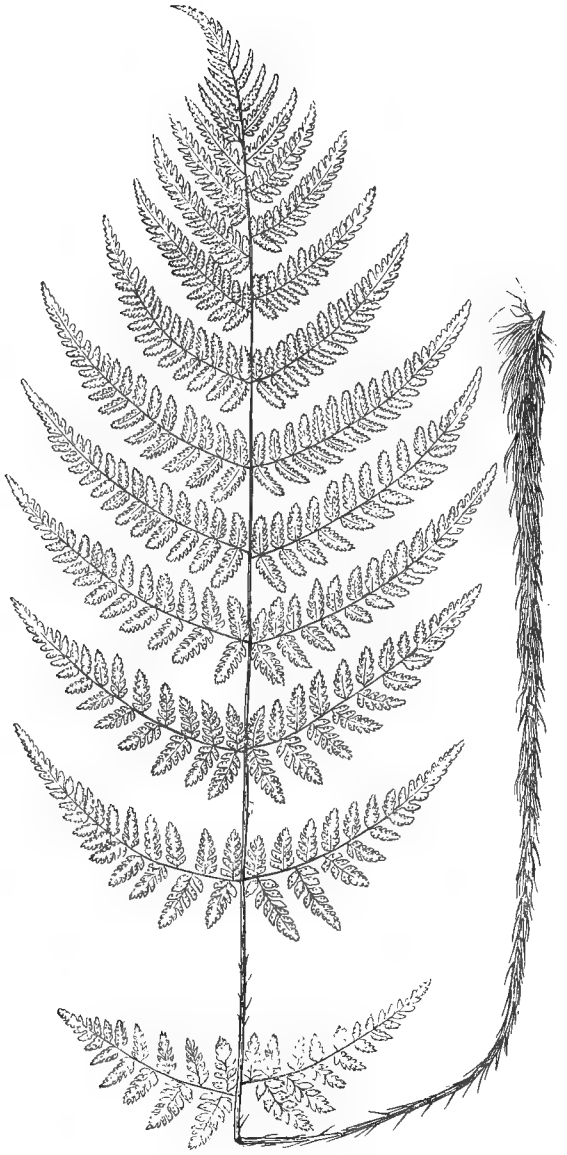
of an intermediate form, produced the lanceolate frond after being some time in cultivation. Notwithstanding the protean character of this fern as regards outline, and notwithstanding the difficulty I feel in giving it anything approaching a *satisfactory* specific description, still, influenced mainly by some peculiarity which arrests the eye, but which I have not yet been able to describe, I incline to regard it as distinct: I do not, however, wish to be understood as contending for the existence of species which cannot be botanically separated.

Culture.

I have had a plant living several years in a cold greenhouse: potted in sandy peat, and well supplied with water and drainage, it becomes yearly more lanceolate.

The figures below represent three scales taken from three species of Lophodium: *a*, spinosum; *b*, multiflorum; *c*, fœnisecii.





ROTH'S FERN, (*one-sixteenth the natural size*).

Characters.

Genus.—Lophodium. (See page 136).

Species. — Multiflorum. Caudex tufted, large, solid, long-enduring, its crown densely scaly: fronds symmetrically arranged round the crown: stipes very stout, nearly as long as the frond, densely clothed with long pointed scales, which are dark brown along the middle but pale at the edges: frond glandular when young, very large, deep green, drooping, ovate-lanceolate, pinnate: pinnæ pinnate; lowest pair usually shorter than the second, third, fourth or fifth: pinnules pinnate or pinnatifid: ultimate divisions serrated, spined: all the divisions of the frond convex: involucre nearly circular, fringed with stalked glands: clusters of capsules circular, covering every part of the frond.

Synonymes, Figures, &c.

Polypodium cristatum, *Linn. Sp. Pl.* 1551; "*Willd. Prod. Berol.* No. 885; *Fl. Germ.* p. 448, No. 6," teste Roth.

Polypodium multiflorum, *Roth, Catalecta Bot.* Fasc. i. p. 135.

Aspidium dilatatum, spinulosum, and dumetorum, *Sm. E. F.* iv. 292—4, and also of *Smith's Herbarium*, now in the possession of the Linnean Society.

Aspidium spinulosum, *Swartz, Syn. Fil.* 420; *Willd. Sp. Pl.* v. 262; *Fries, Summa*, 82.

Polystichum multiflorum, *Roth, Fl. Germ.* iii. 87.

Lastrea spinulosa, *Presl, Tent. Pteridog.* 76.

Lastrea dilatata, *Newm. N. A.* 23; *Bab.* 411.

Lastrea multiflora, *Newm. F.* 215.

Lophodium multiflorum, *Newm. Phytol.* iv. 371, *App.* xvii.

I adopt Roth's name of "multiflorum," not because it has the claim of priority, which is, however, probably the case, but because I cannot feel certain that any prior description was intended to represent that individual species to which Roth exclusively refers. The names of cristatum, dilatatum and spinulosum are indifferently applied to this species by those botanists who think that off-hand decisions are preferable to

painstaking investigations. Be this as it may, I hope to find botanists willing to do honour to Roth's admirable description by adopting his name; for of a truth we may exclaim with him, —"Maximæ sanè et ferè insuperabiles in determinatione hujus filicis difficultates." A volume might be filled in an attempt to unravel its synonymy; and it seems most advisable to adopt, without discussion, the only name accompanied by a description that is really intelligible. I quite agree with Mr. Babington's remark on another name similarly circumstanced to those I have mentioned: that judicious botanist observes, — "As the name has been employed to designate each of them, by one or more authors, it seems desirable to allow it to fall out of use, for its retention only tends to cause confusion." — Phytol. iv. 1160.

Geographical Range.

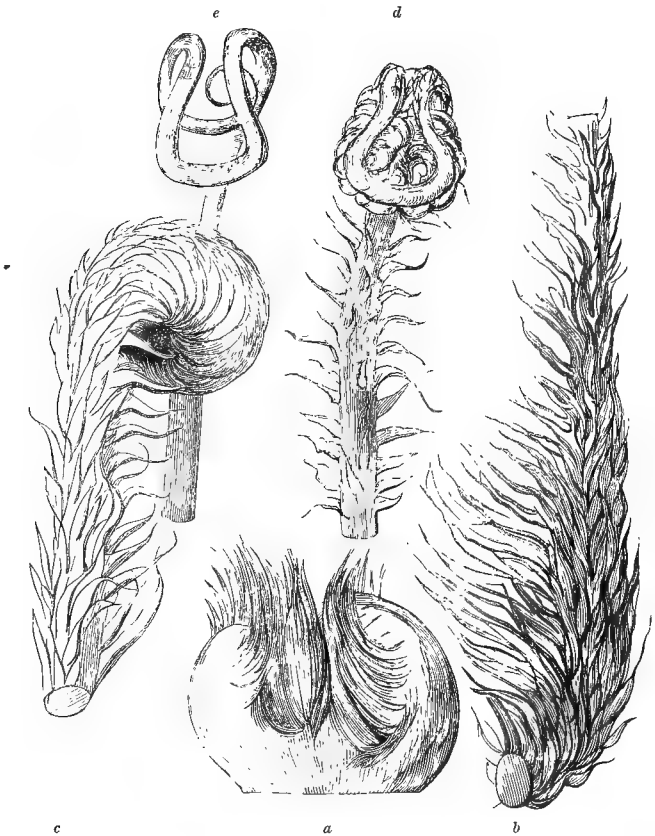
This fern is so imperfectly known that I am unable to give its European range, but believe it to be common on the continent. I have received no corresponding form from my friends in the United States.

I believe this fern to be universally distributed throughout the British Islands: it grows luxuriantly in moist woods, delighting in vegetable mould, and attains a great size on warm, sheltered hedge-banks, particularly if accompanied by a ditch. I am indebted to Mr. Buxton Shillitoe for an enormous caudex of this plant, standing in an erect position nearly a foot above the surface of the soil, and measuring more than a foot in circumference.

Description.

The radicles are numerous, black, wiry, and very tenacious: the caudex is large and tufted; I have never found it either horizontally elongated or branched. The crown of the caudex is densely clothed with large, long, dark brown scales. The fronds rise early in May, and continue to come up until Midsummer; they are symmetrically arranged round the crown,

and are characterized by a peculiarity in vernation which I have not hitherto seen noticed; the main rachis of the frond, instead of being regularly circinate, or composed of diminishing rings, like those of an Ionic volute, is doubled near the insertion of the second pair of pinnæ, and turns back, forming



a kind of loop. I have endeavoured to exemplify this in the accompanying figures, which are of the natural size. Fig. *a* shows the crown of the caudex before the fronds have begun to expand; *b* is the basal portion of the stipes of a young frond; *c* its apex; *d* shows the peculiar bend of the frond above described; and *e* the rachis of the same frond, in the same position, but stripped of its pinnæ and scales.

In favourable situations, the fronds of mature plants, including the stipes, measure five feet in length: this magnitude is, I believe, unequalled by any of our British ferns, except the common brakes and Osmunda regalis. I select for description a specimen, for which I am indebted to Mr. John Ray, of Epping; and first give its dimensions. Total length from the caudex to the apex of frond, 60 inches: from the caudex to the insertion of the first pair of pinnæ, 24 inches: from the insertion of the first pair of pinnæ to the apex of frond, 36 inches. It must, however, be borne in mind, that the relative length of the stipes and frond is subject to great variation, being influenced by situation, degree of moisture, nature of soil, quantity of shade, and a number of other casualties. The length of the first pair of pinnæ is $7\frac{3}{4}$ inches; second pair, $8\frac{1}{2}$ inches; third, $8\frac{3}{4}$; fourth, 9 inches; sixth, $8\frac{3}{4}$; seventh, 8; eighth, 7; ninth, 6; tenth, $4\frac{3}{4}$; eleventh, 4; twelfth, 3; thirteenth, $2\frac{1}{2}$; fourteenth, 2: the remainder rapidly decrease in length, until the frond terminates in an acute point. The lengths of the rachis between the pairs of pinnæ are these: — in the first instance, $4\frac{1}{2}$ inches; in the second, $3\frac{1}{2}$; in the third, $3\frac{1}{4}$; in the fourth, 3; in the fifth, $2\frac{1}{2}$; in the sixth, $2\frac{1}{4}$; in the seventh, 2; in the eighth, $1\frac{3}{4}$; in the ninth, $1\frac{1}{2}$; in the tenth, $1\frac{1}{4}$; in the eleventh, 1; in the twelfth, $\frac{3}{4}$; in the thirteenth, $\frac{1}{2}$ an inch. From these admeasurements it will appear that the form of the frond may be described as oblong-lanceolate, and cannot, in any acceptation of the term, be characterized as deltoid or triangular, words which are almost invariably employed in the description of what is named "Aspidium dilatatum." And I may remark, that although I have examined some hundreds of mature fronds, I have never seen one more nearly triangular than that of which I have given the admeasurements. That triangular fronds do frequently occur, I will not dispute; but these are from seedling or starved plants, or are often without fruit, always of less size, or, from some cause or other, have not attained their normal form. The stipes is very stout at the base, and thickly clothed with long, pointed scales, which are of a very dark brown colour along the middle, pale brown and nearly transparent at the sides: this character is amply sufficient to distinguish this species from those which are generally confounded with it. One of these scales is represented by the

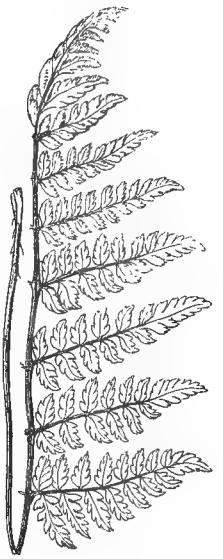
middle figure at page 146. The frond is pinnate: the pinnæ are nearly opposite, and, as we have seen by the admeasurements, the pairs gradually approximate from the base towards the apex: the first and second pairs are very broad at the base, in some instances nearly triangular; the third is longer and narrower; the fourth, fifth, and sixth still longer and narrower, and also more linear, the sides being nearly parallel: all the pinnæ are pinnate, except those quite at the apex of the frond: the pinnules are distinctly separate, and almost stalked; those of the upper pinnæ are connected by an extremely slender wing of the midrib of the pinna, but this wing is not to be distinguished on the lower pinnæ, except near the point; the pinnules of the lower pinnæ are pinnate, those on the middle are pinnatifid, and on the upper deeply lobed: all the divisions are serrated, and each terminates in a short but distinct spine. In the first, second, and third pairs of pinnæ, the inferior pinnules are generally longer than the superior; the first, second, and third inferior pinnules of the first pair of pinnæ are almost invariably longer and altogether larger than those which succeed them; the diminution of the rest in size is sometimes very abrupt, sometimes gradual.

Every lateral vein supplies one lobe or division of a pinnule; it is always branched, and almost every anterior branch bears a cluster of capsules: these are scattered generally over the frond, without any definite arrangement: they are covered by a very irregular but somewhat reniform involucre, the margins of which are uneven, and more or less fringed with stalked transparent glands. These are described as characteristic of Aspidium spinulosum by Swartz, Willdenow, and Fries; and the present plant is thus identified with the A. spinulosum of those authors.

Varieties.

This is usually stated to be a very variable fern; but the degree of variation will, I imagine, be found very much to depend on the number of species included under one name. I do not wish to moot the subtle question of "what is a species?" but I think it is *convenient* to assign a name to every object

that the accustomed eye acknowledges to be distinct: this is the case with the eight Lophodia; whether they are properly termed species, varieties, or forms, matters but little; they are objects with which all cultivators are intimately acquainted, and therefore cultivators, as well as inquirers, will be glad of names whereby to designate them. In conformity with this view, I have separated and named as species all the forms but one, and that one I now propose to describe as a variety.



This plant, for which I propose the name of "nanum," and of which a figure is given in the margin, rather less than the natural size, is dwarf, rigid, and convex in every part, and usually of a very dark green colour, sometimes inclining to brown. The clusters of capsules are large, very distant, very dark-coloured, and conceal, rather than are covered by, a small shapeless involucre, on which I have never discovered the glands observable in the normal form of the plant. It is of frequent occurrence in the boggy and hill districts of Scotland and Ireland, and I have seen it, although more sparingly, on the mountains of Wales, and in the woods of Sussex and Kent. Its character did not appear changed by cultivation for two years at Leominster; and Mr. Tatham, who has paid much attention to this form, informs me that he has observed it in one station for twenty years, but that it never attains a greater size, although the normal state of L. multiflorum, in the same locality, attains a height of three feet.

Culture.

Lophodium multiflorum grows freely in cultivation: planted in rich vegetable mould, it attains an enormous size: it should be abundantly supplied with moisture.

† BENNETT'S FERN.

Characters.

Genus.—LOPHODIUM. (See page 136).

Species.—GLANDULOSUM. Caudex tufted, very large and long-enduring; its crown smooth, pale whitish brown, composed of undeveloped fronds, covered with pale, roundish, concolorous scales: stipes scarcely half so long as the frond, densely covered at the base with large, roundish, concolorous scales: fronds symmetrically arranged round a centre, lanceolate, pinnate, so densely covered on the under surface, as well as on the general and partial rachides, with minute stalked glands, as to have a rough and somewhat clammy feel: pinnæ pinnate: pinnules lobed; the lobes serrated: involucres with stalked glands on the margin.

Synonymes, Figures, &c.

Lastrea glandulosa, *Newm. Phytol.* iv. 256.

I know of no figure of this fern, and suppose that none has ever been published. I distrust my power to make such a drawing as would distinguish it from its congeners, since its distinctive characters are scarcely such as the pencil will portray.

Geographical Range.

I have neither seen nor heard of this fern beyond the limits of three English counties, — Shropshire, Gloucestershire, and Essex; and the first of these I feel strongly inclined to exclude, but extract the passage in which it is indicated: — "Even at equal elevations, there are differences among the plants which have been pronounced specific; as in the instance of L. glandulosa of Newman, a species founded upon a solitary plant of L. dilatata [L. multiflorum] (as it would appear), observed by Mr. Purchas in Dean Forest, Gloucestershire. I am indebted

to Mr. Purchas for a frond from that plant, which is certainly remarkable for its decidedly glandular character; but I possess other specimens which appear to connect it with the more usual form of L. dilatata [L. multiflorum], particularly one from Titterstone Clee Hills, labelled by Mr. Edwin Lees doubtfully, 'Aspidium rigidum?' This specimen is in bad condition, but better may perhaps be gathered there by some botanist, if I add the direction to the spot: — 'North side, among the basalt stones beneath the summit.'" — Mr. Watson, in Cyb. Brit. iii. 270. I have two observations to make on this extract; the first I should not think worth my while, were it not for Mr. Watson's almost proverbial accuracy. 1. My having founded the species on a single plant is not exactly the fact, although I have probably written or said something which has led Mr. Watson to this conclusion. My first acquaintance with the species was through Mr. Bennett and his son, who kindly gave me a magnificent living plant, and I cannot find any allusion to rarity in my correspondence with those zealous botanists relating to this species: moreover, Mr. Bennett has it in his garden at Brockham: and the dried fronds I have examined appear to have been gathered from many plants. Mr. Purchas also speaks of "some young plants." I think I am thus exculpated from the charge of having founded the species on a single plant. 2. During the past summer I visited the Titterstone Clee, and examined the specimens of L. multiflorum which abound in the locality indicated, but cannot refer them to glandulosum.

The Forest of Dean and its neighbourhood remains an undoubted locality; and Epping Forest, in Essex, must be added. Mr. Doubleday has most kindly given me two very large plants from the vicinity of Epping, and has others growing in his garden. The Epping plants are of great age, of almost gigantic size, and perfectly characteristic in all respects: in my communications with Mr. Doubleday, I find nothing to indicate that the plant is uncommon in his neighbourhood.

Description.

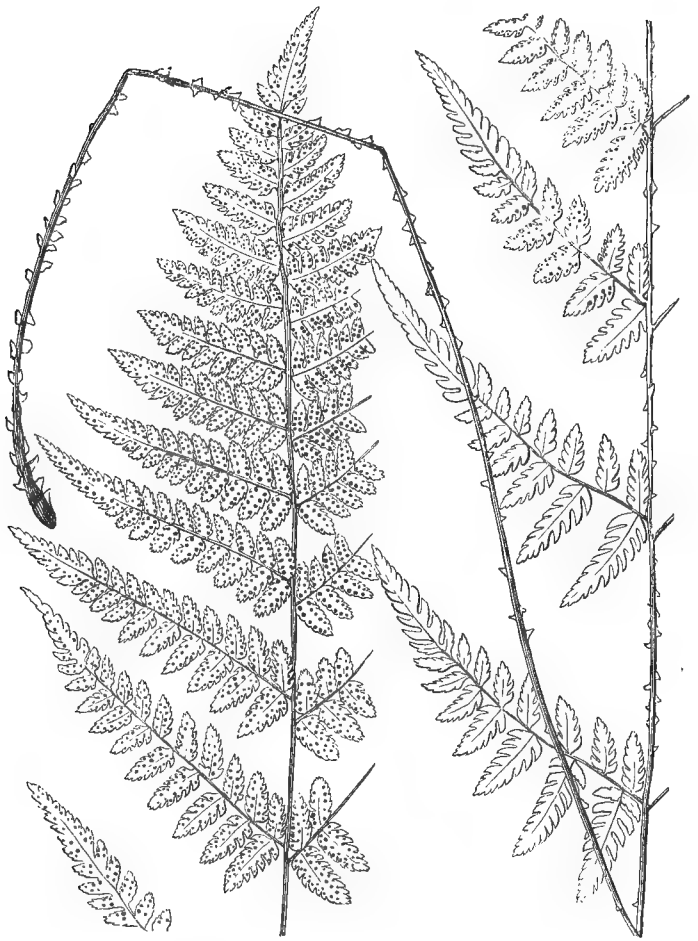
Radicles very numerous, large, long, extremely tenacious, and nearly black: caudex very large, solid, and long-enduring;

its position vertical; its crown very smooth, of a pale whitish brown colour, composed of undeveloped fronds, which are covered with pale, rounded, concolorous, closely appressed scales: stipes notably shorter than the frond, densely covered at the base, more sparingly upwards, with large, flat, nearly round, concolorous scales: fronds very large, semierect, arranged symmetrically round a centre; every part of their under surface, including the general and partial rachides, so densely covered with minute stalked glands, as to convey a most evident appearance of mealiness to the eye, and of roughness and stickiness to the touch. The fronds are pinnate; the pinnules are lobed and serrated, and the teeth of the serratures mucronate. The involucres have stalked glands on their edge, and a few occasionally, not constantly, on their disk.

I am by no means anxious to obtain specific rank for this fern: like Polystichum angulare, Amesium germanicum, and one or two others, it presents just such characters as produce different effects on different minds; in its symmetrical arrangement of fronds it resembles L. multiflorum; but in the pale appearance of the crown, and the outline and colour of the scales, it differs widely from the normal form of that species: again, in its remarkable glandulosity it recedes from spinosum more strikingly than any other species of the genus Lophodium; the symmetrical arrangement of fronds, the strictly tufted character of the caudex, and its very large size, are further objections to its being united with that species.

Culture.

This handsome fern grows luxuriantly in peat, with an admixture of leaf-mould; it retains every peculiarity, and reproduces itself readily from seed. Cultivated side by side with multiflorum and spinosum, under circumstances calculated to produce the greatest state of luxuriance and vigour, it remains notably distinct from both. In a greenhouse it requires a very large pot; a rich vegetable soil intermixed with peat; abundance of water, and good drainage.



WITHERING'S FERN, (*one-eighth the natural size*).

Characters.

Genus.—LOPHODIUM. (See page 136).

Species.—SPINOSUM. Caudex stout, slowly but extensively creeping; its crown composed of convolute unfolded fronds,

smoothly covered with whitish closely appressed flat scales, which do not in the slightest degree conceal their form; stipes as long as the frond, purple at the base, with scattered, broad, rounded, pale brown, diaphanous scales: frond eglandulose, pale green, slightly drooping, elongate, linear, pinnate: pinnæ rather distant, winged, pinnate: pinnules at the base of the pinnæ separated from the midrib by a deep notch, towards the apex of the pinnæ decurrent, all lobed, the lobes serrated, the teeth of the serratures acutely spined: involucre nearly circular, its margins waved, eglandulose: clusters of capsules circular, crowded, sometimes confluent, confined to the upper part of the frond.

Synonymes, Figures, &c.

Polypodium cristatum, *Linn. Sp. Pl.* 1551, ad partem.
Polypodium Filix-femina, γ. spinosa, *Weiss, Crypt.* 316.
Polystichum spinosum, *Roth, Fl. Germ.* iii. 91.
Lastrea spinosa, *Newm. N. A.* 21, *F.* 209.
Lastrea spinulosa, *Bab.* 410,
Lophodium spinosum, *Newm. Phytol.* iv. 371, *App.* xviii.

The nomenclature of this species is involved in much obscurity. I hesitate to pronounce a positive opinion on the subject, but, as already stated, I entertain no doubt that Linneus included it under his Polypodium cristatum, which he describes as growing "sylvis sæpe uliginosis," (Flor. Suec. p. 308, ed. 1). There is some difficulty in fixing an exact meaning to these words; but if we translate them literally, "frequently in marshy woods," we shall have a very correct definition of the usual locality of L. spinosum. It is sometimes thought that that fern is the Polypodium spinulosum of Müller, ('Flora Danica,' 707); but it seems to me that that botanist had neither the merit of separating this species from L. Callipteris, nor any intention of giving a new name, but again combined both in one species, and merely adopted and *misprinted* Weiss' prior name of spinosa. As for the figure in 'Flora Danica' (tab. 707) cited by Withering, it represents but the apical portion of a frond, the decurrent and united pinnules of which resemble L. Callipteris, while the creeping caudex also more nearly resembles that than

the present species; I cannot therefore consent to separate the spinulosa of Müller from the cristata of Linneus. Like Linneus, he probably included both the plants; but neither in his figure nor description do I find any reason for supposing that he restricted the name "spinulosa" to the present species. Withering adopts Müller's name, and restricts it to the present species; so also do Mr. Babington and Mr. Watson: but both these eminent authors appear to me to have fallen into a palpable error of nomenclature, for both name it L. spinulosa of *Presl*, whereas Presl distinctly states that *his* spinulosa is the Asp. spinulosum of Swartz, which is the glandulose plant, and certainly the dilatata of both Babington and Watson. All other British authors ignore the species entirely. Sir J. E. Smith and Mr. Francis omit it altogether, giving the *name*, indeed, but not describing the *plant:* and Hooker and Arnott certainly exclude it from the sixth edition of the 'British Flora.' These learned authors make four varieties of their Aspidium spinulosum, and explain to their readers that α. = L. uliginosum, *Newm.*; β. = "dilatatum, *Willd.*"; γ. = "Fœnisecii, *Bab.*;" and δ. is thus described: — "Pinnules and segments very unequal in size and in their spinulose serratures. A monstrosity?" Mr. Moore, in the second edition of his 'Handbook,' also ignores it as a species, but retains the name as one of his varieties of cristata, the L. Callipteris of this work.

The confusion among continental authors is quite as great as in this country, and Roth is the only one, as far as my information extends, who has properly distinguished the present species: and although I cannot but regret that his name of spinosa should so nearly resemble the one that I reject, yet I trust the difference will be sufficient to fix it in the memory, and I am inclined to believe Roth's is the original name, although, perhaps, first applied to the present plant when it was supposed to be a mere variety of Athyrium Filix-femina. Mr. Lloyd tells me that this fern is the Polypodium spinosum of Linneus.

Geographical Range.

This fern certainly occurs in Germany, Sweden, and Hungary; but beyond these countries I am unable to trace its

geographical range. I am indebted to Mr. Boott for two allied but apparently distinct species from the United States.

It appears to be ubiquitous in the moist woods of the South of England, as far as I have had an opportunity of visiting them. In Wales, it does not occur so commonly; and I have not yet seen a frond gathered in Scotland, and but one in Ireland: for this latter I am indebted to the kindness of Mr. Lovett Darby, who gathered it at Dartrey, the seat of Lord Cremorne, in the county Monaghan. I have no reason whatever for distrusting several informants of Scotch and Irish stations, beyond the fact that this species is little known and seldom recognized as distinct from L. multiflorum; neither can I urge any reason for its non-occurrence in Scotland and Ireland.

Description.

The radicles are nearly black, numerous, and often matted together: the caudex is stout, and gradually increases in length, and becomes branched; I have occasionally seen in woods patches that occupied many square yards, and on digging amongst the fronds with a trowel, have found the tufts so much connected with each other, as to justify the supposition that each patch originally owed its existence to a single caudex. The fronds rise from the ground in April and May, without any symmetrical arrangement, and often exhibit the singular vernation already described under L. multiflorum: the margins of the unexpanded pinnæ are somewhat convolute. The stipes is about equal in length to the frond, and nearly erect; it is clothed with blunt or rounded, semitransparent, uniformly coloured scales, each of which generally terminates in a feeble flexile awn. The frond is slightly drooping, and quite eglandulose; it is long, narrow, pinnate and linear, the pairs of pinnæ, from the first to the eighth inclusive, being generally of uniform length; they are rather distant, and usually ascend at an acute angle from the main rachis. The pinnæ are pinnate, and the pinnules detached and often distant; although connected by a slender wing, they have a deep notch on each side at the base. On the first pair of pinnæ the first and second inferior pinnules are

of nearly equal length, and are nearly twice as long as the corresponding superior ones: this discrepancy between superior and inferior pinnules gradually diminishes, and it altogether ceases with the sixth pair, which are of equal length: a somewhat similar discrepancy is observable in the pinnules of the second pair of pinnæ, but beyond these it becomes scarcely observable: some of the lower pinnules are deeply pinnatifid, almost pinnate: the lobes of the pinnules are toothed, and the teeth terminate in short but sharp and distinct spines; each serrature, with its accompanying spine, has a decided curvature towards the apex of the pinnule.

The veins of the pinnules are alternately branched, each system of branches entering a division of the pinnule, and the anterior branch bearing a circular cluster of capsules just within the sinus which occurs between each two divisions: this cluster is covered by a flat, reniform involucre, the margins of which are sinuate, entire, and *without* glands, a character which, as far as my observation has extended, is constant, and is of great importance in distinguishing the present plant from the spinulosa of Swartz, Willdenow, Schkuhr, Presl, and Francis, all of which I imagine to be L. multiflorum of this work. Owing to the constant position of the clusters on each pinnule, they form a regular double line, the midvein of the pinnule passing up the centre: but when the pinnule is completely divided into lobes, each branch of the vein usually bears a cluster of capsules: this is more frequently the case in those pinnules which are nearest the main rachis of the frond; and it may be observed that the clusters on all, except the usual capsule-bearing branch, are of smaller size. The seed, as pointed out by Linneus and Withering, is confined to the upper portion of the frond. The clusters are usually distinct and perfectly separate. Each branch of the vein enters one of the serratures of the pinnule, but terminates before reaching the spine, with which it is quite unconnected.

Culture.

Like the last, this fern should be planted in peat, which may be mixed with any light soil of the garden, and it is important

to the well-being of the plant, that it should be well supplied with water. In potting, great care should be taken that the pot be sufficiently large, and the compost sufficiently peaty. I believe it difficult to keep it too wet, nor is it important that the drainage be good. I cannot recommend this as an ornamental fern: it is easily broken by the wind, or other casualties, and very early in the summer assumes a shabby and battered appearance; still, the pteridologist should keep it with as much care as the most beautiful, as he will assuredly hear its claims to specific dignity earnestly if not warmly discussed.

† LLOYD'S FERN.

Characters.

Genus.—LOPHODIUM. (See page 136).

Species.—ULIGINOSUM. Caudex tufted: vernation simply circinate: fronds erect, rigid, linear-lanceolate, of two kinds: fertile fronds pinnate: the pinnæ also pinnate: pinnules acute, with a deep sinus at their base: barren shorter and broader, pinnate: pinnæ scarcely pinnate: the pinnules very broad, obtuse, adnate or decurrent.

Synonymes, Figures, &c.

Polypodium cristatum, *Linn. Sp. Pl.* 1551, ad partem.

Polystichum spinulosum, *var.* uliginosum (*A. Braun*), *Döll, Rhein. Flor.* 17, 18. (Vide Phytol. iii. 101).

Lastrea uliginosa, *Newm. Phytol.* iii. 679.

Lastrea cristata, *β.* uliginosa, *Moore, Phytol.* iv. 149, *Handb.* 115.

Lastrea cristata, *β. Bab.* 410.

Aspidium spinulosum, *α. Hook. and Arn.* 571. "The plant under the name of L. uliginosa in the Royal Gardens, corresponds with our A. spinulosum, *α.*" — *Hook. and Arn. l. c.*

Lophodium uliginosum, *Newm. Phytol.* iv. 371, *App.* xix.

The first notice of this fern which I have seen is in Döll's 'Rhenish Flora,' pp. 17 and 18, but I believe it to be copied from a prior work or a MS. of Professor A. Braun. Both these authors are cited by Philip Wirtgen, in his 'Cryptogamic Vasculares of Rhenish Prussia,' published at Bonn in 1847, a detailed notice of which work is given in the 'Phytologist' (iii. 98), whence I extract the following: — "Polystichum spinulosum, *b*, uliginosum, *A. Br.* Stipes rather short, with few, scattered, broadly ovate, short-pointed, brown-yellow scales; frond

doubly pinnate, pinnatifid; pinnæ approximate, the inferior ones a little shorter than the following; teeth of the leaflets rather short, sharp-pointed, appressed.—Growing in the bog at Freiburg, in company with A. cristatum," [Lophodium Callipteris of this work.]

The next notice of this fern, and the *first* of its occurrence in England, is from my own pen; and, by a strange omission, subsequently amended by myself, no allusion whatever is made to the earlier description I have just cited. I proceed to quote from the 'Phytologist.'

"In describing Lastrea spinosa, I have said 'This fern is closely allied to the preceding [Callipteris], and so much do they resemble each other, that I have found it next to impossible to fix on satisfactory diagnostics whereby to distinguish them.' In fact, in the splendid series of L. Callipteris received by the Botanical Society from Bawsey Heath, there were specimens which I found myself unable to refer with confidence to either species. About the same time I received from the Rev. Geo. Pinder, specimens of a very singular fern from Wybunbury bog, in Cheshire; these I referred, without much hesitation, to L. spinosum: the Cheshire and Norfolk specimens were so exceedingly dissimilar in general appearance, that it never occurred to me to compare them together with a view of ascertaining whether they possessed any characters in common.

"Early in August last, Mr. Lloyd, a gardener who has paid great attention to the British ferns, brought me a plant, well established in a pot, of a fern which he considered new to Britain: he had previously shown it to several eminent botanists, and especially those who have paid attention to ferns: others have seen it since it has been in my possession, and although I refrain from giving the names of six gentlemen who have expressed opinions, however confidently, yet not intended for publication, I may perhaps be allowed to record the opinions without the names. I should premise that the plant is in perfect vigour, in full fructification, and without any symptom of disease or malformation: these six gentlemen have pronounced it —

"1. A form of Filix-mas.

"2. Lastrea rigida.

"3. Lastrea cristata.

"4. Lastrea spinosa, a strong variety.

"5. Lastrea dilatata, a rigid variety.

"6. No way different from Lastrea spinosa, *Newm.*, I mean, it would hardly pass for a *var.*

"It is singular that out of six high authorities no two entertain the same opinion. The plant which has elicited such conflicting opinions, has fronds resembling those received both from Bawsey and Wybunbury, and therefore establishes the specific identity of those very dissimilar forms."—Phytol. iii. 678.

The publication of this statement and description was immediately followed by an advertisement of living plants being kept for sale at the Bedford Conservatory, in Covent Garden, so that every botanist who inclined might possess himself of materials on which to found a judgment on the merits of the species. Numbers did so, and the result was the free and candid expression of opinions in the pages of the 'Phytologist.' These opinions were, in almost every instance, very careful, very deliberate, and very decided; either of them, insulated from the others, exhibited such claims to adoption, that it must have been accepted as final: but the aggregate of opinions led to no such conclusion; an equal number of botanists were in favour of and against the adoption of uliginosum as a species, and to this hour I have been unable to satisfy myself whether the arguments pro or con were the more cogent. The reader is therefore referred to the 'Phytologist' for the arguments themselves, (see Phytol. iii. 678, 1087; iv. 22, 55, 72, 96, 105, 149, 476). Our publishing botanists have also expressed their opinions respecting it: Babington makes it his Lastrea cristata, *β.*; and Hooker and Arnott, who have given it marked attention, pronounce it to be their Aspidium spinulosum, *α.* Mr. Babington modestly observes that he is "very imperfectly acquainted with the plant." Before the separation of uliginosum as a species, I expressed a strong opinion that spinosum and Callipteris were extreme forms of one species: Mr. Hort, a very acute botanist, has suggested their union. The following extract from a letter to Mr. Watson is published in the 'Cybele Britannica': — "'I cannot believe L. cristata to be more than a state of L. spinosa. The general character and texture of both agree together, and are quite unlike those of L. multiflora. Those who have seen it growing speak of the plane of each

pinna being nearly vertical to that of the general frond, which is not the case in L. spinosa. But I have seen precisely the same condition in L. multiflora (concurrent with other modifications) in boggy soil, under particular circumstances.' "—Cyb. Brit. iii. 266. And the learned author of the 'Cybele,' when treating of L. uliginosum, adds: — "Perhaps the suggestion of Mr. Hort, before quoted under L. cristata, may be the true solution of the difficulty, by re-combining the three into one species."—Id. 269.

Geographical Range.

We have seen by the quotation from Döll, that this fern occurs in Rhenish Prussia: I possess no other record of its occurrence on the continent.

In Britain it occurs only in exposed marshy situations, or on moist heaths. Wybunbury bogs, Cheshire; Oxton bogs, Nottinghamshire; Bawsey Heath, Norfolk; Epping Forest, Essex. I have received fronds from all these stations, through the kindness of the Rev. Mr. Pinder, Mr. Lloyd, and Mr. Doubleday.

Description

(Of Mr. Lloyd's original plant). Caudex tufted. The fertile fronds are arranged shuttlecock-fashion, spreading from a common centre; in form they are linear, elongate-acuminate at the apex, 30 inches long, 5 inches wide; pinnate: vernation simple, not twisted: the stipes is 9 inches in length, and, together with the rachis, is deeply grooved in front, flattened at the sides, rounded behind, glabrous, bright green above, purple at the base, slightly tinged with purple at the back: the scales are somewhat sparingly distributed, obtusely ovate, with a lengthened acute apex, which is generally twisted, and which terminates in a setaceous point; pale brown, transparent, concolorous: these larger scales are intermixed with others very slender and hair-like: all the scales readily fall off, and leave small black scars on the stipes. Pinnæ elongate-deltoid, with acuminate deflexed apices and a winged midrib; the first, second,

and perhaps third pairs rather shorter and rather broader at the base than the fourth, fifth and sixth pairs, and hence rather more deltoid; they are set on the rachis rather obliquely, so that their upper surface approaches a horizontal position, although the frond is nearly erect. The pinnules are of moderate size, sessile, adnate, deeply notched, the divisions serrated, serratures aristate: first inferior pinnule longer than the first superior. Clusters of capsules on all the pinnæ, but less abundant on the lower ones, relatively small, remaining distinct and separate, except at the apex of the frond; at first green, then white, subsequently black, and finally bright brown: the green colour is due to the frond being seen through the young and perfectly transparent involucre; the white colour is due to the involucre, which becomes opaque and white; the black colour to the ripe and full capsules; and the brown, to the empty capsules and elastic rings. The involucre is regularly reniform, its margin very entire, its disk and margin eglandulose.

The earlier fronds of the season, together with some of the later ones rising from the lateral crowns, are perfectly without fructification: they are shorter and broader, and the pinnæ are longer, broader, and more crowded than in the normal fertile fronds. The marked difference and permanent distinctness between the fertile and barren fronds is a character common to Hemestheum Thelypteris, Lophodium Callipteris, and Allosorus crispus, but does not obtain in the generality of species, all the fronds having, in a very great majority of instances, a tendency to produce fructification, although adventitious circumstances of situation, temperature, soil, &c., may cause an increase or diminution of the quantity of seed produced.

In its vernation and adnate pinnules, this fern resembles Lophodium Callipteris; it resembles L. spinosum in the figure, notching, and aristation of the pinnules; and it also resembles both those ferns in its erect rigid habit, and ovate, diaphanous, concolorous scales, as well as in its entire eglandulose involucre. On the other hand, it differs from Lophodium Callipteris in the more acuminate, more divided, more serrated, more aristate pinnules, also in the more direct course of the veins, a difference much more easily observed than described; it differs also from L. spinosum in the adnate, decurrent pinnules, in the tufted caudex, and the consequent regular habit of growth, and

in the simple vernation: and from both it differs in the more equal distribution of the clusters of capsules over all parts of the frond.

The probability of its being a form of L. Callipteris is said to be strengthened by its occurring in company with that species: but this argument is not valid, for Hemestheum Thelypteris is also a companion of that fern in all its stations; Phegopteris is invariably the companion of Dryopteris; and I believe that Trichomanes speciosum is constantly accompanied by one or both species of Hymenophyllum. This association of species proves nothing more than that a similarity of constitution requires a parity of external conditions: and species of similar constitution will seek appropriate conditions wherever Nature supplies them.

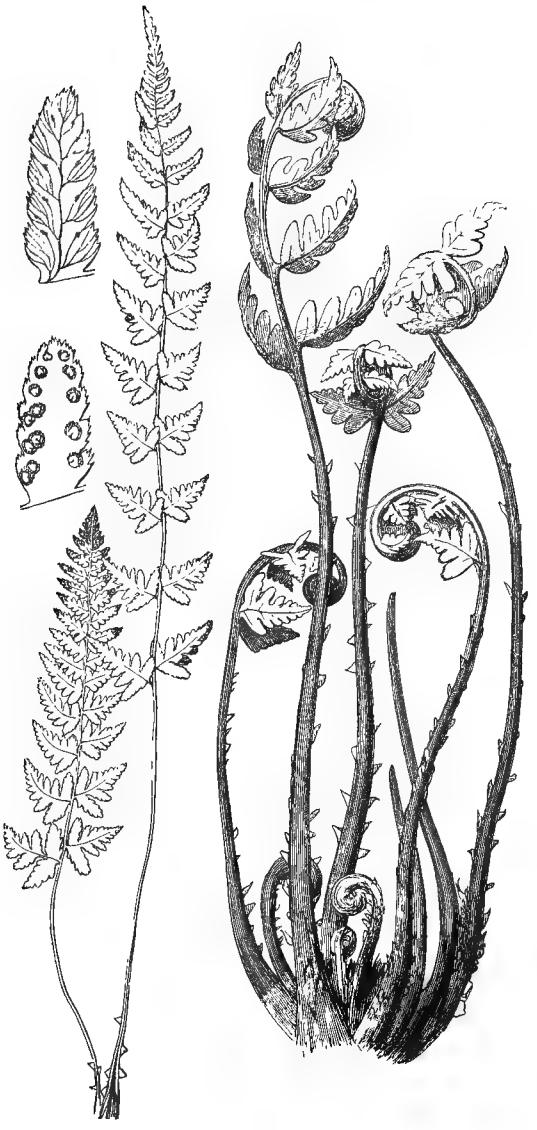
Varieties.

Some of the fronds are narrower and less rigid than the normal form. Pinnæ very distant, very narrow, acuminate, with a winged midrib: pinnules very small, very distant, sessile, adnate, deeply notched, rather obtuse at the apex.

Fronds of this character have a very peculiar and starved appearance, but exhibit the adnate attachment of the pinnules very conspicuously: they spring from a caudex bearing fronds of the normal form; and therefore, by a rule I have previously imposed on myself, cannot be regarded as constituting a true variety.

Culture.

This fern grows freely in cultivation, retaining all the characters which distinguish it as a wild plant: in the spring it is twenty days later than L. multiflorum in expanding, ten days later than L. spinosum, and from ten to fifteen days earlier than L. Callipteris. When potted it requires nothing but peat, and should be kept constantly standing in water.



EHRHART'S FERN, (*a, one-eighth the natural size*).

Characters.

Genus.—Lophodium. (See page 136).

Species.—Callipteris. Caudex very stout, slowly creeping, extending two or three feet: stipes nearly as long as the frond, sparingly clothed with short, broad, pale, semihyaline scales: frond very erect, narrow, linear, eglandulose, pinnate: pinnæ rather distant, short, somewhat triangular, pinnatifid, from five to eight pairs nearly of the same length, but the fifth, sixth, seventh and eighth pairs somewhat the longest, and the others gradually approaching them in length, the distance between each pair gradually decreasing from the base towards the apex: pinnules decurrent, broad, serrated, blunt or rounded at the apex, the lower ones slightly larger and longer than the upper: involucre flat, scale-like, indistinctly reniform, its margin irregular, free, except at the sinus, where it is attached to the capsuliferous vein: clusters of capsules crowded, often confluent, confined to the upper part of the frond.

Synonymes, Figures, &c.

Polypodium cristatum, *Linn. Sp. Pl.* 1551, ad partem.

Polypodium Callipteris, *Ehrh. Beitr.* iii. 77, *Crypt.* 53; *Hoffm. Deutschl. Fl.* ii. 6.

Polystichum cristatum, *Roth, Flor. Germ.* iii. 84.

Polystichum Callipteris, *DC. Fl. Franç.* ii. 277.

Aspidium cristatum, *Sm. E. F.* iv. 289, *E. B.* 2125; *Hook. and Arn.* 569.

Lastrea Callipteris, *Newm. F.* 12.

Lastrea cristata, *Newm. N. A.* 21, *F.* 203.

Lastrea cristata, α., *Moore, Phytol.* iv. 149, *Handb.* 115; *Bab.* 410.

Lophodium Callipteris, *Newm. Phytol.* iv. 371, *App.* xix.

This species is well figured in the 'Flora Londinensis,' (tab. 113). In 'English Botany' the name occurs twice: plate 1949 represents Lastrea Filix-mas, and plate 2125 appears to be intended for the present species, but is not characteristic. In describing L. Filix-mas, Sir J. E. Smith remarks:—"This

species was certainly never mistaken for A. cristatum by the writer of 'English Botany,' p. 1949, but Mr. Sowerby was deceived by a wrong specimen sent him from the Isle of Wight, which he supposed of course to be correct, and from which he drew the figure. The blunder was set right in v. 30, p. 2125, of the same work." — Eng. Flor. iv. 276. To this it may be added that the "blunder," or rather the propensity to make the present species *out of* Filix-mas, was very prevalent, if not universal, at the date in question.

The name of "cristatum" was evidently intended by Linneus to comprise the present and several other plants here treated as species. Hudson, Berkenhout, Withering, and Bolton adopt from Linneus the name of Polypodium cristatum, but apparently without any knowledge of the present species. Ehrhart was the first to describe our plant as a distinct and separate species, under the elegant name of Callipteris, which name has been adopted by Lamarck and DeCandolle, perhaps the best nomenclaturists of the continent, as well as by Hoffmann, in his 'Deutschlands Flora.'

So great confusion exists in the application of the terms "cristatum" and "crested fern," that I think it better to drop both of them. See an admirable observation at page 149 of this work, quoted from Mr. Babington, and applied by that eminent botanist to a precisely analogous case.

Geographical Range.

This fern is of common occurrence upon the continent of Europe, and throughout the United States of North America. I have received American specimens from Mr. Oakes, Mr. Lea, and Mr. Boott, the latter accompanied by living plants, which continued growing for two years at Leominster, side by side with others from Lynn; and although Mr. Lea, of Cincinnati, informs me that Dr. Torrey considers the American plant distinct, I must confess that the two appear to me to be identical.

This is one of our most local ferns, occurring only on boggy heaths, and confined, as far as Great Britain is concerned, to four English counties. I have received, through the kindness of my friends, fronds with this name from two Scotch, four Irish,

one Welch, and two English counties, besides those mentioned below; in every instance there was a mistake in the name.

Cheshire. — The Rev. Mr. Pinder had the good fortune to discover this fern in Wybunbury bog, in this county, and has supplied me liberally with specimens.

Nottinghamshire. — In this county it was first discovered by Dr. Howitt at Oxton bogs, and has since been found at the same locality by the late Mr. Riley, the late Mr. Quekett, Mr. Sidebotham, and several other botanists: Mr. Sidebotham has also observed it at Bulwell marshes. I am indebted to Mr. Riley and Mr. Kippist for specimens from this county.

Norfolk. — The Rev. R. B. Francis, was, I believe, the discoverer of this fern in Norfolk, in the year 1805; it was growing among furze-bushes by the side of a drain: it has since been found in abundance at Edgefield by Mr. Wigham, and on Bawsey Heath, near Lynn, by Mr. Ewing, the Rev. Mr. Mumford, and Mr. Burlingham: it grows intermixed with the common ling, and is shaded by a few young alder trees. Mr. Burlingham, of Lynn, discovered a fourth Norfolk station in 1841; it is near the village of Dersingham, between seven and eight miles from Lynn, on the road to Hunstanton: in this station there are fewer roots, and it does not grow so luxuriantly as at Bawsey, probably owing to there being less moisture and no shade, as here it grows among ling, unaccompanied by alders. I have to record my obligation to the Botanical Society of London, and to Mr. S. P. Woodward, for a fine series of specimens, and to Mr. Bridgman for a supply of living plants.

(Suffolk. — Sir J. E. Smith records that it was gathered by Mr. Davy on bogs, amongst alder bushes, at Westleton, in this county; (Eng. Flor. iv. 300). I do not possess specimens; and Mr. George Wolsey, who has thoroughly searched the neighbourhood, cannot find it. This is one of the counties from which I have repeatedly received specimens incorrectly named; though I don't know that there is any improbability of its occurrence).

Description.

The radicles of Lophodium Callipteris are dark brown, numerous, and often matted together: the caudex is very stout, and gradually increases in length, as the plant increases in age, occasionally emitting a lateral branch, which in due time also becomes branched, so that an old plant is sometimes possessed of a very extensive and complicated caudex, which throws up fronds from all its extremities. The base of the

stipes of each frond, instead of decaying with the frond, retains its sap and vigour for many years, and in time assumes so nearly the appearance of the caudex itself, that it is difficult to distinguish between the two. The figure in the margin below, although certainly not very ornamental, gives a correct idea of a longitudinal section of a portion of caudex. It is drawn of the natural size, and constitutes but a small portion of the plant from which it was taken: the median white space represents the caudex itself, and the shorter ascending white spaces on either side represent the still vigorous bases of old stipes, with the exception of a small branch of caudex near the bottom of the figure, on the right hand side. In the specimen selected for illustration, the interstices between the bases of the stipes, represented by the darker portion of the figure, were filled with matted roots and turfy soil; on removing this, I found every part of the surface of the caudex, as well as the bases of the stipes, covered with rudely semilunar markings, which seemed to indicate the former points of attachment for those chaffy scales with which the crown of the caudex, as well as the stipes, of almost every species of Lophodium appear to abound.

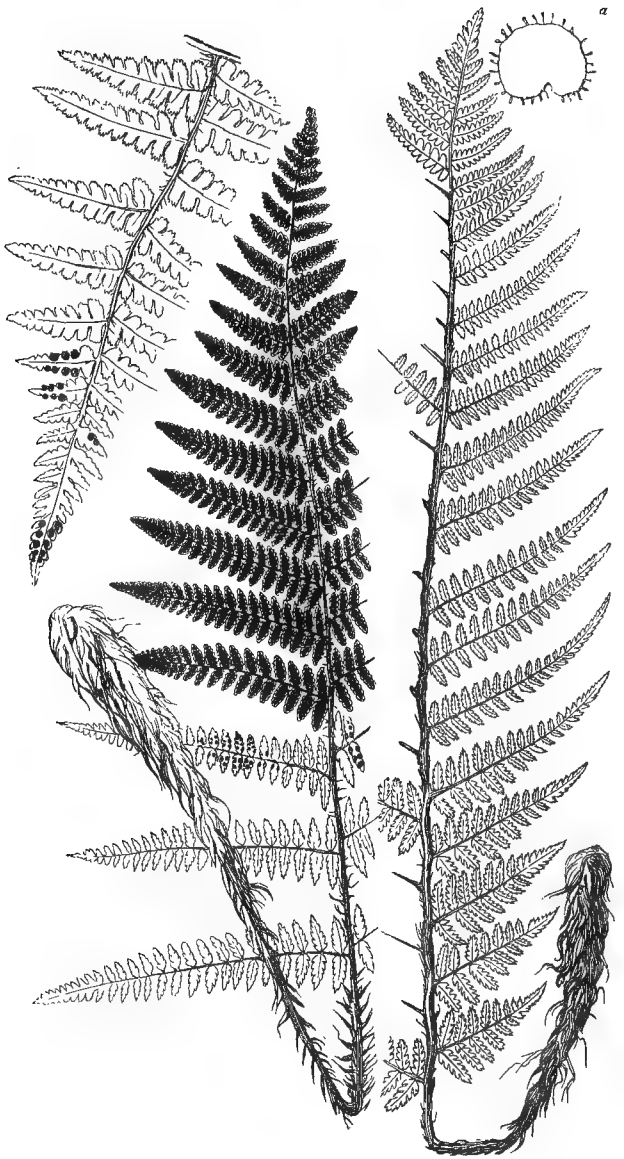
The fronds are but few in each tuft, and rise from the crown of each growing branch of the caudex; they appear in May, and remain green until near the end of the year. The form of the young unexpanded frond somewhat resembles that of Lastrea montana; the general character is circinate, but the pinnæ are perfectly flat, the lower pair being incumbent on the second, the second on

the third, and so on. Young expanded fronds, of the natural size, are shown at *b*, page 169; in every instance they were sketched from living and growing examples, a vigorous plant having been most obligingly sent me by Mr. R. Jacob. The stipes is of nearly equal length with the frond, very erect, and clothed with scattered, broad, obtuse, short, semitransparent, pale brown, uniformly coloured scales. The frond itself is erect, narrow, linear, and pinnate: the pinnæ, which are attached by the stalk only, are generally rather distant, short, broad at the base, nearly triangular and pinnate, or deeply pinnatifid: the pinnules are very blunt at the apex, and serrated both at the apex and along the sides; they are decurrent or united together at the base, and almost invariably attached to the midrib of the pinnæ by their greatest diameter. When the frond is very luxuriant and fruitful, the pinnæ become much more elongate, and the pinnules more remote.

The lateral veins of the pinnules are many-branched, and the anterior branch bears a circular cluster of capsules about half-way between the midvein and the margin: the clusters are covered by a flat, reniform involucre, the margins of which are sinuate, but not jagged or torn; and I have not been able to detect, either on its margin or disk, the slightest appearance of glands. In luxuriant specimens the clusters are much crowded, and finally become confluent; they are always confined to the upper part of the frond.

Culture.

I find that this fern, whether exposed or in a greenhouse, requires a soil composed almost entirely of turfy peat, abundance of water, and only just so much charcoal at the bottom of the pot as will keep the water, in which it should constantly stand, from putrefying. It is by no means an ornamental fern: erect, fragile, constantly broken by the wind, and very liable to premature decay at the apex, it is only desirable as affording the means of botanical comparison with cognate species. It likes full exposure to the sun.



RIGID FERN, (*one-fourth the natural size*).

Characters.

Genus.—Lophodium. (See page 136).

Species.—Rigidum. Caudex tufted: stipes much shorter than the frond, densely clothed with broad reddish brown scales: frond semierect, glandulose, sweet-scented, lanceolate, pinnate: pinnæ very numerous: pinnules oblong, obtuse, serrated, scarcely mucronate: involucre flat, its free margin fringed with stalked glands: clusters of capsules very crowded, covering the pinnules, confined to the upper part of the frond.

Synonymes, Figures, &c.

Polypodium fragrans, *Linn. Sp. Pl.* 1089, (1st edition); *Huds. Fl. Ang.* 388, (1st edition); *With. Arr.* 650; *Vill. Hist. Pl. Dauph.* iii. 843.

Polypodium rigidum, *Hoffm. Deutschl. Fl.* ii. 16.

Polystichum strigosum, *Roth, Fl. Germ.* iii. 86.

Aspidium rigidum, *Schkuhr*, p. 40, tab. 38; *Hook. E. B. S.* 2724; *Franc.* 40; *Hook. and Arn.* 569.

Lastrea rigida, *Newm. N. A.* 19, *F.* 191; *Bab.* 411; *Moore*, 111, (excl. the figure).

Lophodium rigidum, *Newm. Phytol. App.* xxi.

There are but few figures of this fern: that in Schkuhr is admirable; those in 'English Botany' and Francis's 'Analysis' are not to be spoken of in terms of praise.

With regard to the name of this fern I have long suspected we are in error. I am quite inclined to believe it identical with that originally described as Polypodium fragrans by Linneus. The first description by Linneus answers well for the present plant: — "Fronds sub-bipinnate lanceolate, pinnules crowded, their lobes obtuse, serrated, stalk scaly," (Sp. Plant. 1089, ed. 1); and he adds, as if to enforce the character of the serrated lobes: — "It has the habit of Filix-mas, but is much less, the pinnules are more thickly crowded, their lateral lobes obtuse and more deeply serrated," (Id. l. c.) Linneus also quotes Amman's "Dryopteris rubum idæum spirans," which is an excellent description of this species: and the Linnean authentic

specimen, although very small and in a wretched state, has no character that contravenes such a conclusion, while the remarkable involucres (some of which are still in good preservation, and closely agree with that figured at *a* on page 175), and the toothed but scarcely mucronate divisions of the pinnules, are rather in favour of its being a dwarf individual of that species. Hudson, in his first edition, quotes the description by Linneus in the 'Species Plantarum,' and gives as its only habitat "the moist fissures of rocks near Keswick, in the county of Westmoreland," (Fl. Ang. 388). Thus far all the evidence appears in favour of the supposition that the Lophodium rigidum of the present work is the Polypodium fragrans of both authors: and it may be remarked, in allusion to the small size which is insisted on by Linneus and by Amman, and is observable also in the Linnean specimen, that the average height of this fern on the continent is nine or twelve inches, and that Sadler gives its height in Hungary as "six inches to a foot." We must now place the subject in another light. In his 'Mantissa,' a work of the highest authority, we find Linneus giving a second description of Polypodium fragrans, from a French specimen, and totally different from that in his 'Species Plantarum.' It is as follows: — "Fronds bipinnate, pinnæ ovate sublobate obtuse, beneath naked, the margin reflexed, and the fructification marginal," (Mant. ii. 307). In this description, it appears to me that the obtuse pinnæ (evidently pinnules) naked beneath, with reflexed margins and marginal fructification, are the characters of Lastrea montana: few botanists have gathered that plant without observing that the margins of the pinnules, if not originally reflexed, almost immediately become so. Hudson, in his *second* edition, gives this *second* description as his character of the plant, (Fl. Ang. ii. 457, ed. 2); so that we are left in the pleasing belief that in the *first* instance both authors described L. rigidum, in the *second*, L. montana. Abler botanists must hereafter decide what course is to be adopted in the nomenclature; for the present, I adhere to that I have previously employed. It may also be mentioned, that the present plant appears to me to be the Polypodium fragrans of Villars's 'Histoire des Plantes de Dauphiné,' (iii. 843).

Geographical Range.

This species is an inhabitant of Hungary, Germany, France, Italy, Russia and Siberia; but I am not aware of its having been found in Africa or America.

It seems confined to limestone rocks in mountainous districts, and has hitherto, so far as regards Great Britain, only been found in three (? four) English and one Irish county.

Westmoreland.—Mr. Simpson informs me he found it "in great profusion growing out of broken limestone, on the declivity of a hill just by the border of Lancashire:" he observes, "I never saw any fern in such masses, several hundred fronds being together in a compact bundle, so much so, indeed, that when I had pulled two hundred, no diminution of the quantity was observable." Miss Beever, in a letter of subsequent date, says that it grows "most profusely on and near Arnside Knot." Mr. Pinder, at a still later period, writes thus: — "I met with Lastrea rigida in great profusion along the whole of the great scar limestone district, at intervals between Arnside Knot, where it is comparatively scarce, and Ingleborough, being most abundant on Hutton Roof crags and Farlton Knot, where it grows in the deep fissures of the natural platform, and occasionally high in the cleft of the rocks: it is generally much shattered by the winds, or cropped by the sheep, which seem to be fond of it. With regard to the shape of the frond, I may mention that among some hundreds of specimens I found but one or two which agreed with your figure [see the right hand, then the only figure, on page 175] drawn from an Ingleborough specimen, all mine being more or less triangular [see the left hand figure], and not having the lower pair of pinnæ shorter than those in the upper and middle part of the frond: the fronds of young plants are remarkably triangular. The two forms of frond no doubt depend upon the situation, whether sheltered or otherwise, and on other causes; still I imagine the triangular to be the true form of the plant, having been informed by a person resident in the neighbourhood, that the plant from Ingleborough assumes the triangular form in cultivation. I do not know whether it has been recorded that this fern possesses a slight scent, not at all unpleasant, but strikingly different from that of other ferns."

Yorkshire.—The Rev. Mr. Bree first recorded this fern as British: he found it growing on Ingleborough, on the north-west side, near the foot of the mountain; and it has been found in the same locality by the Rev. Mr. Pinder. Mr. Tatham informs me that "it grows abundantly in the fissures of limestone rocks, at an elevation of 1550 feet above the level of the

sea, and 1050 feet above the town of Settle: and also on rocks called White Scars, above Ingleton, on the left or north side of the valley."

Lancashire.—It was found by the Rev. J. Smythes, near the top lock of the Lancaster and Kendal canal. (See Phytol. i. 478).

(Somersetshire.—"I beg to inclose a frond of what I believe to be the true Lastrea rigida. I found a single plant, bearing only four fronds, in a somewhat bleak and exposed situation within a few miles of Bath. I searched diligently for other plants, but without success."—Mr. J. E. Vize, in Phytol. iv. 1101. "Observing in the last number of the 'Phytologist' that a solitary plant of Lastrea rigida had been found near Bath by Mr. J. E. Vize, may I suggest the possibility, if not the probability, that it had been planted there by Potter, a well-known fern-collector, now dead, *en route* to Cheddar for Polypodium calcareum; having heard from his own mouth that he did so with other plants, in order to save their extermination."—Mr. G. B. Wollaston, in Phytol. iv. 1134).

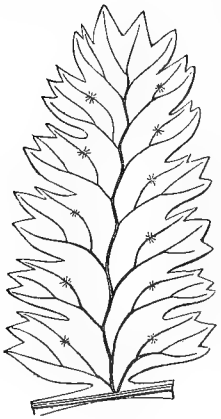
In Ireland it has been found in one locality only, and that on a wall. I am indebted to Mr. Lovett Darby for a specimen, accompanied by the following note:—"I gathered this fern early in the present month (September), in the county Louth, at Townley Hall, the residence of Mr. Balfour. It was growing on a wall, built of clay-slate, and much over-hung with trees: I saw about thirty plants of it."—Mr. C. L. Darby, Phytol. iv. 726.

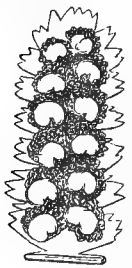
I have to acknowledge my obligation to all the botanists mentioned above, for specimens from the various localities, with the exception of that in Lancashire.

Description.

The radicles are long, and the caudex large and tufted: the stipes is unusually thick at the base, and very densely clothed with large, pale red, concolorous scales, which are present, although less abundant, throughout its entire length; the proportion of the stipes to the frond varies between a fourth and a half: the frond is nearly erect, lanceolate, and pinnate: the pinnules are more or less crowded; those towards the base are more distant than those in the middle and upper part of the frond; they are also sometimes shorter and somewhat triangular, but this character appears rather the exception than the rule, for in the specimens so kindly and liberally supplied me, I find by far the greater number have the first pair of pinnæ fully as long as either of the others: all the pinnæ are pinnate: the

pinnules are sessile, but attached by a very narrow base, and so deeply divided into lobes as to appear almost pinnatifid; the lobes are toothed, the teeth broad and scarcely mucronate: this character I consider of importance, as affording an excellent diagnostic whereby the present species may be readily distinguished from its congeners. The lateral veins are alternate, and each is forked almost immediately after leaving the midvein: the posterior branch is again divided, and each ramifies into a serrature of the lobe: the anterior branch bears a circular cluster of capsules about midway between the midvein and the margin; these masses, which are ten or twelve in each pinnule, are always approximate, and finally completely confluent; each of the masses is covered by a reniform lead-coloured involucre, which is attached to the vein by a short stalk placed in the lateral sinus. The upper figure in the margin shows the veins and the points of attachment of the capsules; the marginal figure below shows the clusters of capsules with their involucres in the natural situation. The involucre is furnished with a fringe of stalked glands, as represented at *a*, in page 175. Over the surface of the frond are scattered numerous minute, spherical, and nearly sessile glands; from these, in all probability, is emitted the scent which has caused so many authors to call this plant by the name of "fragrans." Mr. Pinder called my attention to these glands; he informs me they are more conspicuous in the living than in the dried plant, and impart to it a glaucous hue.





Varieties.

The frond varies in form from ovate-lanceolate to oblong-deltoid, and, in some fronds, almost to exactly deltoid; but in this species, as in others of the genus, the deltoid form is accompanied by a smaller caudex, indicative of youth, and the

elongate-lanceolate form by the larger and more massive caudex, which indicates age: all the ferns of this genus appear long-lived; and attributing, as I do, variation in the circumscription of their fronds to external conditions, as of shade, age, luxuriance, &c., I will not presume to define, much less to name, the various gradations of form. Whenever I have proposed characters, either as those of varieties or of species, I have not based them on the circumscription or cutting of the frond.

Culture.

This fern grows with vigour in the ordinary soil of gardens, requiring no shade, but enjoying moisture. In pot-cultivation, I find it thrive in a mixture of peat and loam, with pieces of limestone or oolite intermixed: it seems to enjoy abundant watering, and likes being watered with lime-water. The drainage should be good, as its roots will not bear constant contact with water: in the hill regions where it abounds, the fall of rain is frequent and abundant, but the water passes off by percolation through the soil, or by other modes of escape, and never stagnates about the caudices or radicles of the ferns.

The following formula may be useful, as affording the means of comparing at a glance the names now proposed for the species of my genus Lophodium with those adopted by our systematic British botanists for the same plants: the latest edition is quoted in each instance.

Lophodium, *Newman.*	Lastrea, *Babington.*	Aspidium, *Hook. & Arn.*
Fœnisecii, *Lowe*	= Fœnisecii	= Spinulosum, γ.
Collinum, *Newm.*	= Dilatata, β.	
Multiflorum, *Roth*	= Dilatata, α.	= Spinulosum, β.
Glandulosum, *Newm.*		
Spinosum, *Roth*	= Spinulosa	
Uliginosum, *Newm.*	= Cristata, β.	= Spinulosum, α.
Callipteris, *Ehrh.*	= Cristata, α.	= Cristatum
Rigidum, *Hoffm.*	= Rigida	= Rigidum
		Spinulosum, δ.

Four additional names are introduced into Mr. Moore's 'Handbook,' as varieties, — "Smithii," "dumetorum," "angusta," and "maculata:" the following are the characters and synonymes which accompany them: —

"γ. *Smithii:* fronds narrowly subtriangular-elongate-ovate, bipinnate; pinnæ opposite horizontal distant; pinnules narrowly decurrent with the slender wing of rachis, oblong obtuse serrated, the serratures incurved; scales of the stipes dark two-coloured, and except at the base small narrow and scattered.

"Aspidium spinulosum, *Smith, Eng. Fl.* iv. 279, according to a specimen communicated as authentic by Mr. H. Shepherd.

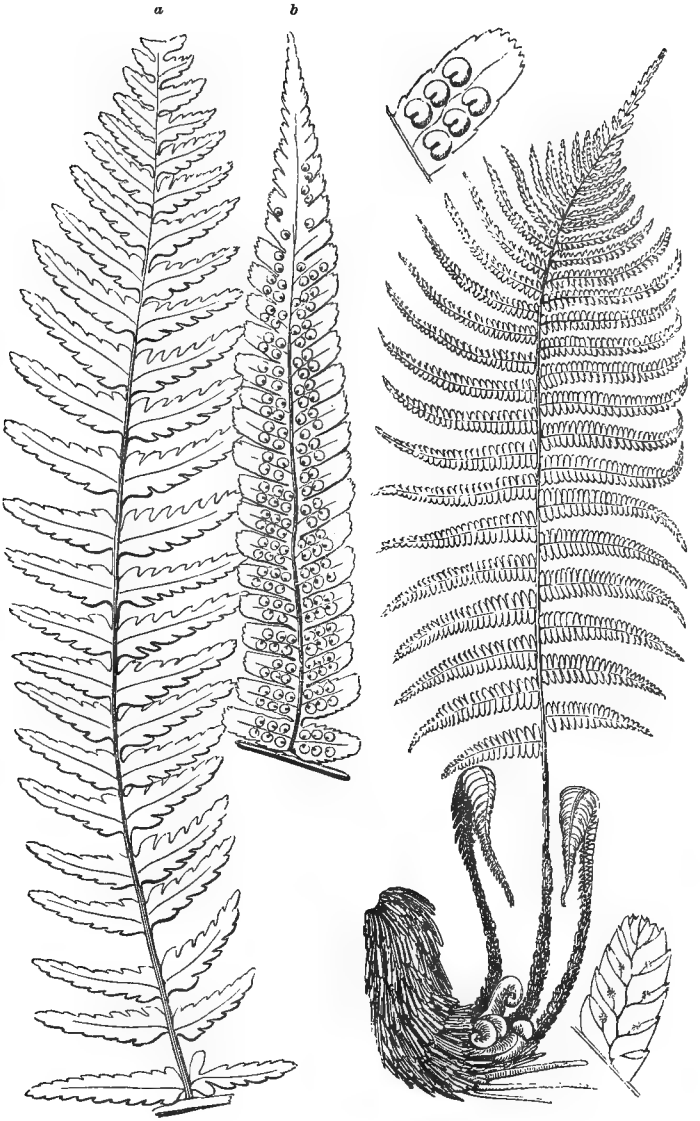
"δ. *dumetorum:* fronds broadly subtriangular ovate, bipinnate dwarf; lobes of the pinnules strongly serrated at the ends; scales of the stipes two-coloured but pallid.

"Aspidium dumetorum, *Smith, Eng. Fl.* iv. 281.

"ε. *angusta:* fronds linear-lanceolate bipinnate; pinnæ short deltoid, the inferior and superior pinnules of the lowest pinnæ very unequal; scales of the stipes two-coloured but pallid.

"ζ. *maculata:* fronds oblong-ovate, with stalked glands beneath, most numerous along the ribs; bipinnate; scales of the stipes broad-lanceolate, whole-coloured, pallid.

"Lastrea maculata, *Deakin, Florigr. Brit.* iv. 110."—Handb. 123.



MALE FERN.

(*The detached pinnæ, a, affinis, and b, Borreri, represent pinnæ of the natural size*).

Characters.

Genus.—Dryopteris. Caudex large, massive, and persistent, erect, its growing extremity always composed of a most obvious crown of undeveloped fronds: first upper and first lower pinnules nearly equal in magnitude, and neither notably larger than the succeeding pinnules: the ultimate divisions of the fronds are bluntly toothed, the teeth not terminating in a spine: midvein of ultimate divisions distinct; lateral veins divided, each branch running into a tooth, but ceasing before reaching its apex: clusters of capsules seated on the anterior branch, half-way between its origin and apex, completely inclosed by a reniform involucre, which has no exposed margin, but is attached at its emargination which is directed towards the base of the capsuliferous vein.

Species.—Filix-mas. Caudex tufted: stipes short, densely clothed with reddish scales: fronds semierect, lanceolate, pinnate: pinnæ numerous, pinnate: pinnules serrated: involucre strictly reniform, without stalked glands: clusters of capsules confined to the upper part of the frond.

Synonymes, Figures, &c.

Polypodium Filix-mas, *Linn. Sp. Pl.* 1551; *Lightf. Fl. Scot.* 671; *Huds. Fl. Ang.* 458; *With. Arr.* 775.

Polipodium Filix-mas, *Bolt. Fil. Brit.* 44, t. 24.

Polystichum Filix-mas, *Roth, Flor. Germ.* iii. 82.

Aspidium Filix-mas, *Swartz, Syn. Fil.* 55; *Sm. E. F.* iv. 288, *E. B.* 1458 *et* 1949, (excl. the text); *Mack. Fl. Hib.* 340; *Hook. and Arn.* 569.

Aspidium cristatum, *Sm. E. B.* 1949; *Mack. Fl. Hib.* 340.

Dryopteris Filix-mas, *Schott, Fil.*

Lastrea Filix-mas, *Presl, Tent. Pterid.* 76; *Newm. N. A.* 19, *F.* 197; *Bab.* 410; *Moore*, 103.

The name of "Filix-mas," or "male fern," seems to have been ascribed to the present species by universal consent. Gerarde, Ray, and all our earlier authors, give it one or both of these designations.

The genus Dryopteris was established by Schott in his 'Filices' (vol. and page unnumbered), and founded on D. Filix-mas: it differs from Lophodium in the remarkably perfect and reniform involucre, which entirely incloses the capsules as in a bladder. I have already stated (page 131) why such ferns as this cannot properly be transferred to Bory's genus Lastrea.

Concerning trivial names, I shall have more to say presently.

Geographical Range.

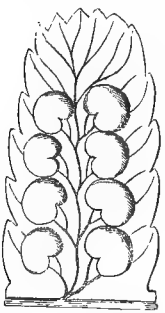
The male fern is found in every country of Europe and Northern Asia, and has been collected in Africa. Beck gives it as a native of North America, but it does not occur in either of the collections I have received from the United States, through the kindness of Messrs. Boott, Lea, and Tuckerman.

This is a most abundant species, and one which seems to delight in wooded and cultivated districts: although scattered over every part of the kingdom, it is ever most abundant in rich soil and shady situations: it lives to a great age, and the fronds of each succeeding year appear to increase in size.

Description.

The radicles are extremely strong and tough; they are of a dark brown colour, and penetrate very deeply into the earth: the caudex is tufted; if in a favourable situation, it elongates slightly every year, so that in very old plants it makes a decided appearance above ground, and its crown appears to be seated on a short trunk; more often, however, it assumes a pendant position, as represented at page 183, the crown of the caudex curving at the extremity, and the fronds growing in a nearly erect position. The fronds make their appearance in May; at first they are perfectly circinate, but after a few days the apex of each is liberated, and hangs down, the frond at this period possessing the bend which characterises a shepherd's crook, as represented at page 183. In this state it is very tender, and is generally cut down by the late frosts of spring: the loss is, however, quickly supplied; a second series of fronds

make their appearance, and, expanding at a more congenial season, arrive in safety at maturity. The fronds are mature in August, and last to the middle of winter quite uninjured: they are generally fertile, but plants are not of unfrequent occurrence which produce only barren fronds; and these are generally larger and greener, and have the pinnules more deeply serrated than when fertile. The fronds vary from five to ten or more in number; their position is nearly erect, or, perhaps, somewhat slanting, and radiating from a common centre. The length of the fronds averages between two and three feet, and the stipes constitutes nearly one-fourth of this, and is very chaffy. The form of the frond is lanceolate and pinnate: the lower pinnæ are considerably shorter than those of the middle of the frond, but never approach the diminutive size of those of Lastrea montana: all the pinnæ are nearly linear, but acute at the apex; they are regularly pinnate: the pinnules are somewhat obtuse, dentate at the extremities, and serrated at their margins. The lateral veins are forked half-way between the midvein and the margin: after the fork, the anterior branch bears a nearly circular cluster of capsules; these are covered by a smooth, lead-coloured, reniform involucre, which is attached to the back of the vein at the point where the stalks of the capsules are inserted: the involucre is more perfect, conspicuous, and lasting than in any other British fern: the lateral veins do not quite reach the margin of the pinnules, and the anterior branch of each is not quite so long as the posterior.



Varieties.

In retaining the forms of Filix-mas under that specific name, I feel that I may perhaps be charged with a diversity of practice, having, in the case of the Lophodiums, assigned specific rank to forms which are certainly not more distant from each other. Such a charge, apart from explanation, seems just; but this difference obtains. In Lophodium I admit no intermediate forms, but include all the individuals I have ever seen in one

or other of the proposed species: in Dryopteris, I select three prominent forms, which constitute links in a chain: these links I shall describe; the other links, the connecting links, remaining undefined, and the entire chain constituting the species. This chain consists of a series of plants, commencing with a frail submembranaceous texture, lax habit, large size, copiously divided frond, and deciduous nature, and terminating in a tough leathery texture, rigid habit, dwarf stature, little-divided frond, and persistent nature.

1. Fischer's Male Fern: DRYOPTERIS AFFINIS: DRYOPTERIS FILIX-MAS, var. *affinis*.

Synonymes &c.

Polystichum Filix-mas, var. 1, *Roth, Flor. Germ.* iii. 84. "Frondibus tri-quadripedalibus latissimis. Filix palustris maxima dentata. *C. Bauh. Pin.* p. 358, *Prodr.* p. 150. *Bergen, Flor. Francof.* p. 330, n. 4. *Böhmer, Lips.* n. 718. *Var. Buxb. Halens.* p. 113. Nonne *Erford.* p. 309, n. 2. *Var.* Spectabilem hancce varietatem in Germania minus copiosam nondum vidi, quam C. Bauhinus in Prodromo l. c. descripsit."—*Roth, l. c.*

"Aspidium affine, *Fischer et Meyer*, in Hohenack. Enum. Talüsch. p. 10. *Ruprecht*, in Beitr. z. Pflanzenk. d. Russ. R. iii. p. 36."—*Ledebour, l. c.*

Polystichum affine, *Ledebour, Fl. Ross.* xiv. 515.

Lastrea Filix-mas, fig. b., *Newm. F.* 197.

Lastrea Filix-mas, β. incisa, *Moore, Phytol.* iii. 137, *Handb.* 103; *Bab.* 410.

Aspidium Filix-mas, var., *Francis*, 39.

Aspidium Filix-mas, β. erosum, *Hook. and Arn.* 569.

Passing over the earlier notices, those of Roth, and the authors whom he cites, because unaccompanied by a name, we come to those of Fischer and Meyer, Ruprecht, and Ledebour, all of whom give the plant the name of "affine." Ledebour's character is very clear and very distinctive, and no one, so far as I can ascertain, doubts the identity of the plant now under

consideration with the Aspidium or Polystichum affine of those authors: but against this an earlier name is brought on the carpet by high authority. Sir William Hooker refers this fern to his Aspidium Filix-mas, but also considers that it is identical with the Aspidium erosum of Schkuhr, found by that eminent pteridographer near Dresden, and figured in his great work, (t. 45). This opinion is repeated by Mr. Francis (Anal. 39), and again by the distinguished authors of the sixth edition of the 'British Flora;' and acting on this, but not believing it a species, they call the fern Aspidium Filix-mas, β. erosum. These learned botanists have evidently omitted to observe that the A. erosum of Schkuhr has a flat involucre, with reniform outline, and free elevated margin, beset with stalked glands: these and other characters bring the A. erosum of Schkuhr very near to the Lophodium multiflorum of this work. The next notice of this plant is in the 'British Ferns' (p. 201), where I have purposely abstained from giving it another name: I acknowledge my obligation to Miss Browne, of Tallantire Hall, near Cockermouth, for a series of specimens, and then point out the characters in which it differs from the ordinary form of Filix-mas, and figure a distinctive pinnule. Mr. T. Moore redescribes this fern in the 'Phytologist' (iii. 137), giving it the name of Lastrea Filix-mas, *var.* incisa; but he goes unnecessarily out of his way to criticise my prior description, saying that Mr. Newman "does not very distinctly explain nor indicate its peculiarities." In order to prove this, he cites my brief diagnosis *minus* the following words: — "*The pinnules are longer, narrower, and more distant* [than in the ordinary form of Filix-mas], *as represented in the pinna figure* a [page 183]: *the first upper pinnule is generally much longer than the first inferior.*" And thus he really appears to justify his very uncandid observation.

Geographical Range.

Roth, as we have seen, notes this fern as an inhabitant of Germany, and Ledebour gives it the following range in the Russian empire: — "In the South of Russia near Stawropol; in the Caucasus near Somchetia; in the territory of Eliza-

bethpol, and province of Karabagh; also between Liman and Perimbal." I believe it is not uncommon on the continent.

In England I believe it to be not uncommon. I am indebted for my first acquaintance with it to Miss Browne, of Tallantire Hall, near Cockermouth, in Cumberland, who obligingly sent me an abundant supply of fronds. Dr. Allchin has observed it growing very luxuriantly near Bangor. My friend, Mr. Clark, found it extremely fine in King's Cliff Vale, near Bridgwater, in Somersetshire. Mr. T. Moore finds it near Guildford, in Surrey; and Mr. A. G. More in the Isle of Wight.

Description.

Radicles and caudex unknown to me: stipes about one-fourth as long as the frond, which is very large, robust, broadly lanceolate, and pinnate: the pinnæ are distant, linear-lanceolate, very long, and pinnate: the pinnules are very distinct and distant at the base of each pinna, nearer towards the apex, but not crowded; they have a narrow basal attachment, but are strictly sessile; they are narrow and gradually acuminate, the sides are deeply notched, and the teeth of the lobes serrated; each pinnule is frequently slightly auricled at the base: the clusters of capsules are in a single series on each side of the midvein, and extend nearly to the apex of each pinnule. The frond assumes the autumnal brown hue very early, but the lifeless fronds, as in Eupteris aquilina, retain their attachment throughout the winter: the scales of the stipes and rachis are of a rusty brown colour.

2. Borrer's Male Fern: Dryopteris Borreri: Dryopteris Filix-mas, var. *Borreri*.

Synonymes &c.

None, as distinguished from Filix-mas, but *certainly* many, and *possibly* most, of the synonymes cited for Filix-mas belong to the present plant.

There is an evident allusion to this fern in the sixth edition of the 'British Flora,' as below: — "Mr. Borrer finds a variety, common in Devonshire, with more copious and brighter coloured scales on the stipes and rachis, and with a bright golden yellow tinge on the whole frond."

Mr. Backhouse, in the passage cited below, evidently alludes to this fern as a variety.

Geographical Range.

I have seen this fern repeatedly in continental collections, but not distinguished as a variety. I have no reason to doubt its frequent occurrence throughout the continent of Europe, but the ordinary continental form of Filix-mas manifestly approaches more nearly to the plant previously described.

The first recorded British habitat of this fern is in Devonshire, where it was observed by Mr. Borrer, (see Hook. and Arn. 569); but the plant has been familiar to me for many years. I have found it occasionally in Herefordshire, Shropshire, Worcestershire, Sussex, Surrey and Kent, but always regarded it as the true or normal form of Filix-mas, because it has been selected for representation by almost all authors. Mr. Backhouse extends its range northwards; he writes thus:—"The plant noticed in Hooker and Arnott's Flora as a variety of Lastrea Filix-mas, noticed in Devonshire, with a rachis scaly nearly throughout its length and of a yellowish hue, is frequent in the mountain districts of Yorkshire, Durham, and of at least some parts of Scotland. Its pinnules are nearly entire, truncate or perhaps truncately obtuse and slightly toothed at the apex: the paleæ are reddish brown, and the fronds, especially in a young state, of a yellowish green. At the High Force, in Upper Teesdale, on both sides of the river; near St. John's Chapel, Weardale, Durham; at the Bilberry Reservoir, Holm Moss, (where it attains a height of four feet); near Huddersfield, Yorkshire; in glens of the Clova mountains, particularly the ravine of White Water, which is at the head of Glen Dole; I have especially noticed this plant growing in many of these localities along with the common variety." —(See Phytol. iv. 715). In Wales it is far from uncommon: I was especially struck by its extraordinary beauty at Hafod, the seat of the Duke of Newcastle, in Cardiganshire, where I was assured it was planted on the slopes by the late Colonel Johnes, the friend of Sir J. E. Smith, and the builder of the mansion. Nothing can exceed the taste displayed by that gentleman in converting naked and unpicturesque hills into scenery as

lovely as any the United Kingdom can boast: the very ferns obeyed his will; this golden-coloured wilding having been brought by wagon-loads and planted so as to form an undergrowth to his wooded slopes, in lieu of the common brakes. The woods are themselves artificial, yet being planted with a perfect knowledge of the "ars celare artem," they hang over cataracts, fringe streams, or cap eminences just as Nature might be supposed to scatter them when in her wildest and happiest mood.

Description.

Radicles and caudex unknown to me: stipes about one-fifth as long as the frond: fronds narrow-lanceolate, pinnate, rigid, symmetrically ranged round a centre: the stipes is clothed with beautifully ruddy-golden scales; these, as usual, are much larger and broader at the base, but are continued as scales, or under the form of hairs, throughout the general and partial rachides, imparting their beautiful hue to the entire under surface: the leafy portion of the frond is leathery, slightly glabrous, and yellowish green: the pinnæ are very numerous, very approximate, linear, and acute at the apex; they are deeply pinnatifid, sometimes almost pinnate, but the pinnules are always confluent at the base, and approximate at their margins; they are usually truncate, or, perhaps, more correctly speaking, truncately obtuse and toothed at their apices; the lateral margins toothed: the clusters of capsules are large, few in number, and confined to two or three pairs at the base of each pinnule: the involucres are perfectly reniform and very enduring: upon the upper side of the frond there is frequently a dark spot on the partial rachis, at the base of each pinna: this character was pointed out to me by Mr. Wollaston, whose knowledge of the British ferns infinitely exceeds that of any other botanist with whom I have ever enjoyed the opportunity of conversing, and this gentleman considers it not only a constant but an important diagnostic character: still, having carefully noticed its diversity in living, and its very frequent absence from dried specimens, I feel disinclined to adopt Mr. Wollaston's views without modification.

3. DeCandolle's Male Fern: DRYOPTERIS ABBREVIATA: DRYOPTERIS FILIX-MAS, var. *abbreviata*.

Synonymes &c.

Polystichum abbreviatum, *Lam. et DC. Fl. Franç.* ii. 560. "On pourrait, au premier coup-d'-œil, prendre cette espèce pour une simple variété de la fougère mâle, mais elle est de moitié au moins plus petite; ses pinnules sont plus courtes, plus obtuses, et presque d'égale largeur dans toutes leur étendues: leur lobes sont plus larges, plus courts et moins nombreux, et chacun d'eux ne porte ordinairement à sa base qu'un seul groupe de fructifications, tandis qu'on en trouve plusieurs à la base de chaque lobe dans la fougère mâle."—*Fl. Fr. l. c.*

Lastrea Filix-mas, var. *Newm. F.* 202.

Lastrea Filix-mas, *var.* abbreviata, *Bab.* 410; *Moore*, 104.

Geographical Range.

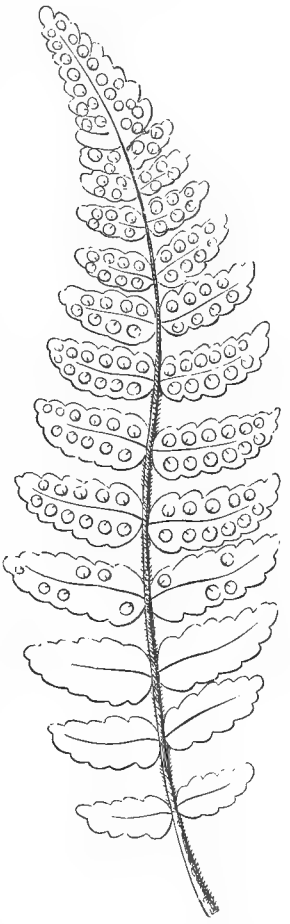
"Cette plante a été trouvée dans les Landes, par les C. Dufour et Thore."—*Fl. Fr.* ii. 560. I know of no other extra-British habitat besides the French one thus indicated.

In England, the only recorded stations are Ingleborough Hill, in Yorkshire, where it was found by the Rev. Mr. Pinder, to whom I am indebted for a frond; and the basaltic cliffs of Teesdale, where it was found by Mr. Backhouse, and, according to that acute botanist, is "common."—(See Phytol. iv. 715).

Description.

Radicles and caudex unknown to me: stipes not more than a sixth of the entire length of the frond, clothed with lanceolate, pale brown, concolorous scales, the margins of which, in the specimens I have examined, are serrated: frond lanceolate, pinnate: pinnæ about twenty pairs before they are lost in the

apex, elongate-triangular, the basal pair very short, and almost equilateral, but having all the angles rounded, the succeeding ones gradually increase in length, but the interspaces decrease; the lower pair of pinnæ are pinnate, but the upper ones only pinnatifid: pinnules adnate, and, except the basal pair, decurrent, very closely approximate, very blunt and rounded, serrated; the teeth of the serratures broad and blunt: clusters of capsules reniform, generally two, sometimes three, at the base of each pinnule; these form a series on each side of the midrib of each pinna, and are closely contiguous thereto.



Two other forms still remain. 1. The "recurvum" of Francis (Anal. 36), which was found by Mr. Cameron on Snowdon, and is of dwarf habit, and has all the ultimate divisions of the fronds crisped and *turned upwards*, as in Fœnisecii. Mr. Francis says *turned down:* but as the late Mr. Cameron showed me his original plants, and transmitted by my hands to London the specimens upon which Mr. Francis appears to have founded his named variety, there is little doubt as to our referring to the same form. We perhaps use different terms to express the same thing: the readers of the 'Phytologist' have seen that the word "recurved" may be understood as curved *upwards* or curved *downwards*. My friend, Mr. Pamplin, of Frith Street, most obligingly presented me with living plants of this fern, collected by himself: like Mr. Cameron's, they were of very diminutive size and slow growth.

2. Another strange example of variation occurs in the herbarium of the late Mr. Winch, now in the possession of the

Linnean Society, and is figured on the preceding page. It is precisely analogous to the Lonchitiform specimens of Polystichum aculeatum, the frond being simply pinnate, the margins of the pinnæ waved, and quite undivided: it does not appear to be a young or seedling plant, being as fully fruited, in proportion to its size, as fronds of larger growth. Dr. Johnstone, in his 'Terra Lindisfarnensis,' has the following passage on this frond: — "It was first described in my 'Flora of Berwick,' (ii. p. 11): and I gave Mr. Winch his specimen. He seems to have omitted the habitat, *viz.*, Ennis, Clare, Ireland, where it was gathered in abundance by the Rev. John Baird."

Culture.

The male fern is remarkably easy of culture; it enjoys rich and light soil of any kind, and does not require any protection. Is has a very beautiful appearance when grown under trees.

Economical Uses.

The medicinal properties of the male fern were formerly highly extolled. All our herbalists, ancient and modern, from Dioscorides to DeCandolle, agree as to its value as a vermifuge. Tragus prescribes the root for this purpose, (p. 547); and Gerarde, quoting the authority of Dioscorides, writes thus: — "The root of the Male Ferne, being taken to the weight of half an ounce, driveth forth long flat worms as Dioscorides writeth, being drunke in Mede or honied water, and more effectually if it be given with two scruples or two third parts of a dram of Scamonie or of Black Hellebore: they that will use it must first eat Garlicke. The root hereof is reported to be good for them that have ill spleenes, and being stamped with swines grease and applied it is a remedy against the pricking of the reed." — Ger. Em. 1130. Tragus has a very curious passage on the subject of its curing wounds inflicted by reeds, and says, that so great is the antipathy of the male fern and the reed to each other, that where one grows the other will not. The same author recommends a piece of the root of this fern to be laid

under the tongue of a horse that has fallen sick from any unknown cause: by this application the disease will be expelled, and the horse recovered.

I learn from my friend, Mr. Hanbury, of Plough Court, that this fern is still used in medicine; and, although long neglected, is returning into some favour with the medical profession. We also learn from the Edinburgh 'Monthly Journal of Medical Science,' that the powdered root or oleo-resin of male fern is an excellent remedy for tape-worm, (page 556).

But perhaps the best summary of the medical properties of Filix-mas is to be found in the 'Phytologist,' from the pen of Dr. Lauder Lindsay: —

"Lastrea Filix-mas.—This has been repeatedly used, of late, in different wards of this hospital, as an anthelmintic, in the treatment of tape-worm, (*Tænia solium*). It has also been extensively applied to the same purpose by the profession in Edinburgh, and other parts of Scotland. It had fallen into disuse greatly in this neighbourhood, in consequence of supposed inefficiency, but undeservedly so, until Prof. Christison, in two papers published in the 'Edinburgh Monthly Medical Journal,' for June, 1852, and July, 1853 ("On the Treatment of Tape-worm by the Male Shield Fern"), showed that the want of success, in some cases, depended on bad preparations of the root, or old roots, being used. He found it almost uniformly successful in the form of an oleo-resinous extract, obtained by percolation of the root with ether. It is recommended in the dose of eighteen to twenty-four grains, followed by a purgative. In many parts of England, nothing is more common as a vermifuge than half a drachm to a drachm of the powder of the root, made up in the form of an electuary, with a little treacle or jelly; in other parts of the country, the oil of the male fern is an equally common nostrum. But in neither of the latter conditions can its action be relied upon, especially if purchased in the shops of druggists, who generally not only sell old roots and bad preparations, but some the roots of totally different species. It is most apt to be, and has most frequently been, confounded with Athyrium Filix-femina, the root of which, it has yet to be proved, has a similar virtue. If time permit, in the course of this summer I intend making a series of experiments, to determine whether the same anthelmintic, or what,

properties reside in the roots of other of our common ferns. This fern was first used at Genève, by Peschier, some twenty or thirty years ago, in the form of an etherial extract; but it appears to have been recommended as a vermifuge by Theophrastus, Dioscorides, and Galen; and it formed the chief part of Madame Nouffer's celebrated remedy for the tape-worm. It does not appear to be accurately determined on what special ingredients of the root its vermifuge property depends: we know it contains tannic and gallic acids. There is some contrariety of opinion as to the proper period of the year for collecting the plant for use; Peschier regarding it as most effectual if gathered between May and September, and Prof. Christison considering the date of collection immaterial. The only caution necessary in using it is, probably, that it ought always to be had *fresh;* if gathered and prepared by the practitioner himself, so much the better. The oleo-resin, however, seems to retain its properties for a considerable time; though what this period accurately is, still remains *sub judice.* It has been found quite efficient after being kept a year, (Prof. Christisn, *loc. cit.*) Prof. Christison commends it as a less disagreeable and more efficient anthelmintic than the 'Abyssinian Kousso, the continental pomegranate, or the American turpentine. It is surprising that Peschier's observations, made on a very large scale indeed, have attracted so little attention in Britain.' Dr. Küchenmeister recently made a number of experiments upon the relative value of vermifuges in common use, by immersing living worms in albumen at a temperature above 77° Fahr., and adding the anthelmintic. He found Tænia crassicornis, thus treated with the etherial extract of the male fern, died in two hours and three quarters, — a longer period, however, than in the case of Kousso (*Brayera anthelmintica*, an Abyssinian rosaceous shrub). Pereira gives an excellent article on this fern in his 'Materia Medica' (vol. ii. part 1), which may be referred to for particulars as to the chemistry of the root. See also Christison's 'Dispensatory,' Royle's 'Materia Medica,' Graves's 'Hortus Medicus,' and other works on Medical Botany, or the Pharmacopœias."—Dr. Lauder Lindsay in Phytol. iv. 1062.

The following extract is from the 'New Homœopathic Pharmacopœia': —

"Tincture of Polypodium Filix-mas. — We gather the plant

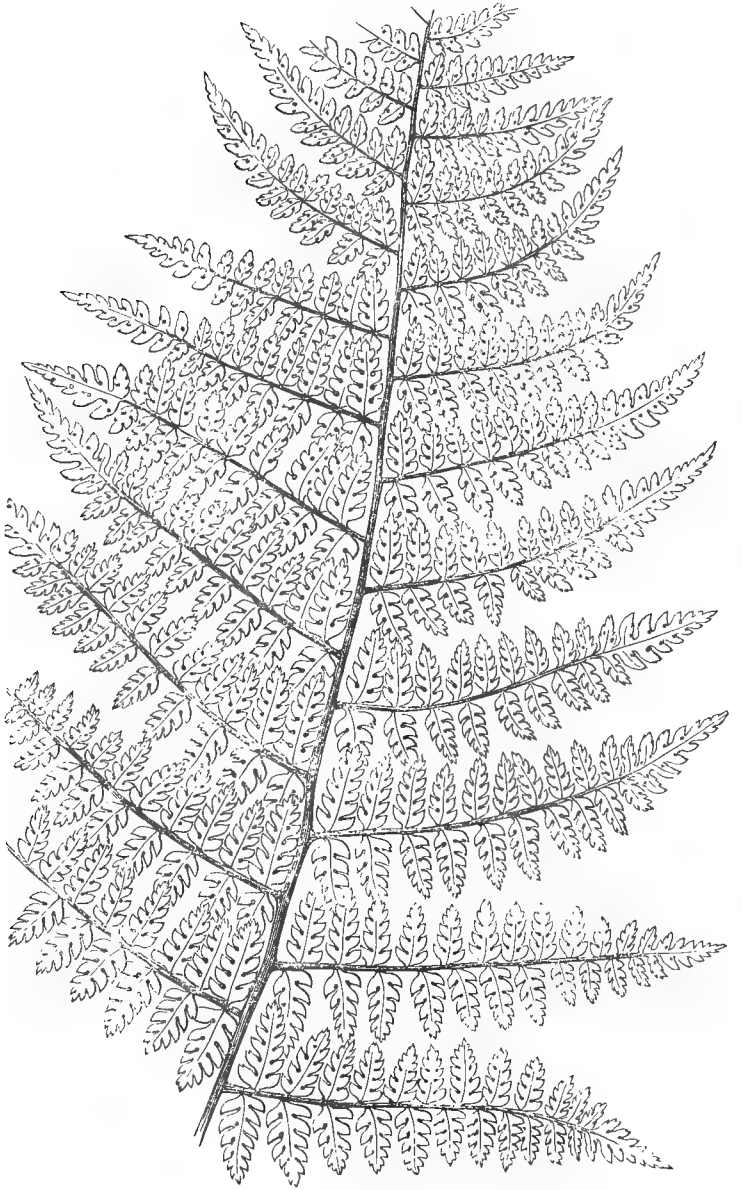
in the summer months. That which grows on stony declivities towards the North is considered the most efficacious. Of the fresh dug roots we take the inner marrow, and we likewise take the youngest rudimentary leaves which are neither withered nor gangrened, of a bright green colour, a strong sweetish and offensive smell, and similar taste, which afterwards becomes bitterish, acerb, and slightly astringent. Both are stripped of their brown epidermis, after which we prepare according to class 2."—See Phytol. iv. 1098.

There is no doubt in my mind that all ferns with a large tufted caudex are used for this purpose, both by allopaths and homœopaths. I have found great difference of opinion among chemists, as to what plant is really the Filix-mas of medicine, some even contending that it is the Ctenopteris vulgaris of this work; and I have never yet met with a "simpler" who could distinguish between Dryopteris Filix-mas and Polystichum aculeatum: but, from the best informed, I learn that the "male fern" of medicine *ought to be* the species now under consideration.

Schkuhr says that this fern, together with its roots, is used in dressing leather, and the ashes in bleaching linen and in the manufacture of glass; there are, however, many earlier notices than Schkuhr's of these different uses, especially as regards glass. Parkinson writes: — "Of the ashes of Ferne is made a kinde of thicke or darke coloured greene glasse in sundry places in France, as in the Dutchy of Maine &c. (and in England also as I have been told by some), out of which they drinke their wine."—Park. The. 1039. In Norway its fronds serve as fodder for oxen, horses, sheep and goats: when dried, it furnishes good litter for cattle, and when decayed, is a valuable manure.

"Formerly," continues Schkuhr, "this fern and its root were applied to many superstitious uses, since divers vagabonds prepared from the latter, together with its young, incurved, and yet unexpanded fronds, the so-called 'lucky hands,' or 'St. John's hands,' which they sold to ignorant and credulous people, both in town and country, as preservatives against witchcraft and enchantment. This still goes on in our own enlightened time; and it is a great scandal to Christianity that many men believe more in such things than in anything else.

Only a few years ago a clergyman's wife in this neighbourhood purchased one of these St. John's hands for four shillings; and I have known others buy little bits cut from such a hand for four to eight groschen, to be given in drink to their cattle, as a means of protecting them against enchantment and witchcraft: it is a pity that such remedies will not also protect us against death." Tragus also informs us that some of the uses to which this fern was formerly applied, are too scandalous to relate. It is very amusing to find almost every one of these old botanists bewailing the wickedness and credulity of times gone by, yet recommending herbs for the most improper uses, or assigning to them the most marvellous powers: our old friend, Gerarde, after many a kind warning to his readers against credulity, winds up his 'Herbal' with an avowal of implicit faith in the fable of the barnacle goose tree!



ALPINE LADY FERN, (*representing exactly of the natural size so much of a small frond as could be shown on the page*).

Characters.

Genus.—Pseudathyrium. Caudex large, massive, persistent, its growing extremity always composed of a most obvious crown of undeveloped fronds: pinnæ with the first upper pinnule as large as or larger than the first lower, neither conspicuously larger or longer than the second and succeeding pinnules: midvein of each pinnule distinct; lateral veins alternate, running to the margin, where they cease: clusters of capsules small, quite round, at first distinct, but sometimes crowded when mature, always perfectly without involucre, seated on the lateral veins, but not at their extremity.

Species. — Alpestre. Caudex tufted: stipes very much shorter than the frond: frond broad-lanceolate, pinnate: pinnæ numerous, crowded, sublinear, acute, pinnate: pinnules numerous, approximate, adnate, broadest at base, subacute at apex, lobed, lobes crenate: lateral veins branched: clusters on the anterior branch, and apparently in the sinus of the pinnule.

Synonymes, Figures, &c.

Polypodium alpestre, *Koch, Syn.* ed. 9. p. 974; *Godet, Flore du Jura*, 851; *Moore*, 50.

Polypodium rhæticum, *Pallas, It.* 28; *Fries, Summa*, 82; *Ledebour, Fl. Ross.* xiv. 510; *Woods, Tour. Fl.* 423.

Aspidium alpestre, *Schkuhr*, 58, t. 60.

Aspidium rhæticum, *Swartz, Syn. Fil.* 59; *Willd. Sp. Pl.* v. 280; *Sprengel, Syst. Veg.* iv. 107.

Pseudathyrium alpestre, *Newm. Phytol.* iv. 370, *App.* xiv.

This fern is placed in the genus Polypodium or Aspidium, according to the taste of the author describing it; proving the comprehensive character of those genera. I venture to give it a new generic appellation, but offer no arguments in favour of the course adopted, leaving it entirely to the better judgment of future pteridologists to make their selection. The specific name seems more readily settled: this fern has but two, alpestre and rhæticum; the latter was given by Linneus to Filix-femina, but as the name of Filix-femina became generally

adopted, the name of rhæticum became unrepresented: as a remedy for this, Roth, followed by Newman and Moore, transfer it to a form of Filix-femina; Hudson to fœnisecii; Bolton, Withering, Villars and Willdenow to fragile; Swartz, Fries, Ledebour and Woods to alpestre. On this subject I again refer the reader to Mr. Babington's opinion, cited at page 149 of this work.

Geographical Range.

This fern occurs in Norway, Sweden, Switzerland, Germany and Russia, and probably also in other European countries: but, if so, the records have escaped me.

In Great Britain it is at present only known as a native of Scotland, where it appears to grow in the greatest profusion, particularly in Forfarshire.

For my knowledge of this as a British fern I am indebted to the kindness of Mr. Watson, who describes the localities &c. in the following passage: — "In July, 1841, I gathered two fronds of this fern in the great corrie of Ben Aulder, a lofty mountain situate on the west side of Loch Erricht, Inverness-shire, which is part of the boundary line between the East and West Highland provinces. Another frond of the same species was picked at some other spot in the neighbourhood of Loch Erricht, probably on the hills between Ben Aulder and the north end of the lake, but it might be on the hills of Drumochter Forest, eastward of the lake; and if the latter, the station would be within Moray or Eastern Inverness. In 1844, I brought a frond of it from Canlochen Glen, in Forfarshire. These specimens (except the second from Ben Aulder, given to Mr. Babington) remained in my herbarium until 1851, first doubtfully labelled, and then temporarily forgotten. Their close resemblance to small fronds of Athyrium Filix-fœmina made me feel very uncertain whether they could be properly referred to Polypodium, until Mr. Newman (to whom the Canlochen frond was at length shown, when again recollected) decided it to be Polypodium alpestre. Now that it is known to be a native of at least two Highland counties, we may reasonably expect that it will be found in other counties by botanists who seek it in the knowledge of its close resemblance to Athyrium Filix-fœmina, for which latter fern this species may readily have been mistaken and passed by." — Cyb. Brit. iii. 253. It has since been found in vast quantities by Mr. T. Westcombe and Mr. Backhouse. The former gentleman, under date "Clova, July 23, 1852," writes as

follows:—"Herewith I forward a sample of a certain fern, common in this district, and which I consider is the Polypodium alpestre. I found it in Canlochen, and also in Glens Prosen and Fiadh; and it is commoner than Athyrium Filix-femina, and varies much in size, from *four inches* to three feet in length. When large, it has quite the appearance of Athyrium Filix-femina, and *when small, and in fructification, looks more like a Cystopteris.*"—Phytol. iv. 652. Mr. Backhouse, in a communication dated "September 13, 1852," writes thus:—"After Thomas Westcombe, of Worcester, left us, we (*i. e.*, my son and myself, who were subsequently joined by G. S. Gibson) continued to find Pseudathyrium alpestre in all the corries of the Dee-side mountains, and those of the neighbouring districts. It was often mixed with Athyrium Filix-femina, at an elevation of from 2000 to 3000 feet; but from 3000 to 4000 feet Filix-femina had ceased, and P. alpestre was plentiful. In damp gorges, and among tumbled rocks, it was often destitute of fructification; but in more open places it was abundantly in fructification, varying from *six inches* to three feet four inches in height. *A remarkable variety, with deflexed pinnæ, was only met with in one place in Glen Prosen.*"—Id. 715.

Description.

Radicles strong and numerous: caudex massive, enduring, erect, exhibiting no tendency to lateral elongation; its crown broad, gibbous, scaly: fronds arranged with regularity round the crown, but the symmetrical appearance is lost when lateral crowns are formed: stipes short, clothed but not densely with long, pale brown, semidiaphanous scales, which are broad near the base and acute at the apex: fronds broad-lanceolate, rigid, pinnate: pinnæ twenty or thirty on each side before they begin to merge in the apical portion of the frond, approximate, ascending, sublinear, acute, pinnate: pinnules about twelve pairs on each pinna, sessile, but the point of attachment so narrow that they appear almost stalked, broad at the base, deeply divided into lobes on the sides, subacute at the apex; the lobes, as well as the apex, serrated: the lateral veins once or twice dichotomously branched: the clusters of capsules small, quite round, seated on the back of the anterior branch of the vein, but not at or very near its extremity, each having the appearance of being seated in a sinus between two lobes of a pinnule; perfectly without involucre.

FLEXILE LADY FERN, (*natural size of a large plant*).

Characters.

Genus.—PSEUDATHYRIUM. (See page 200).

Species.—FLEXILE. Caudex massive, its position erect, its crown broad, gibbous, scaly: fronds ranged somewhat symmetrically around the crown, estipitate, linear-lanceolate: pinnæ short, distant, deflexed, blunt, pinnate: pinnules sessile, obovate, obtuse, serrate: lateral veins unbranched, each bearing a circular cluster of capsules about half-way between its base and apex: involucre none.

Synonymes, Figures, &c.

Pseudathyrium flexile, *Newm. Phytol.* iv. 974.

The earliest notice of this fern is in the June number of the 'Phytologist' for 1852, where it is incidentally mentioned by Mr. Westcombe, when writing of P. alpestre. He uses these expressions:—"When small, and in fructification, it [alpestre] looks more like a Cystopteris."—Phytol. iv. 652. Three months subsequently, Mr. Backhouse, also writing of P. alpestre, observes:—"A remarkable variety, with deflexed pinnæ,was only met with in one place in Glen Prosen."—Id. 715. Both communications appear at page 202 of this work, the passages re-referring to flexile being there printed in Italics. The matter stood thus until the 18th of May, 1853, when I received for examination the entire collection of these ferns made by Mr. Backhouse and his son, and a more splendid series need not be desired. I at once perceived that the supposed "variety" from Glen Prosen was a species, and, sitting down, I penned characters of the two species, purposely contrasting them. These were published in the 'Phytologist' for June, 1853. (See Phytol. iv. 971).

On the 24th of May I exhibited these ferns at the Anniversary Meeting of the Linnean Society, when they were inspected by the President, Robert Brown, and by several other leading botanists; and neither then, nor on any *subsequent* occasion, has any botanist who has seen flexile suggested to me the possibility of including it in any previously described species. Mr.

Westcombe and Mr. Backhouse entirely abandon the idea of its being a form of alpestre, although there can be no doubt, as we have seen, that this idea did present itself to both of them at the moment of finding it, possibly because they were totally unprepared for the occurrence of a second new fern, on ground for so many years trodden by our Scottish friends in their herborizing excursions.

Geographical Range.

Hitherto found only in Glen Prosen, in Forfarshire, by a party of botanists consisting of Messrs. James Backhouse, Thomas Westcombe, and James Backhouse, jun., to all of whom I am indebted for the opportunity of examining a series of specimens. In this locality it appears to be most abundant, and doubtless will be found generally distributed, like alpestre, over the highland glens of Scotland.

Description.

Radicles very large, strong, and much branched: caudex massive, enduring, its position erect, its crown broad, gibbous, scaly: fronds estipitate, by which term I intend to convey the idea that the rachis bears pinnæ, more or less developed, from its apex to its junction with the caudex; linear-lanceolate, very elongate, very attenuate, very flexile, the last character due to the tenuity of the rachis; pinnate: pinnæ short, gradually narrowed, rather blunt, rather distant, deflexed, pinnate, about fifteen pairs before they lose their distinctness at either extremity; those towards the base gradually diminish in size as well as length, and finally become almost rudimentary, though their divisions are not proportionally diminished in number: pinnules distinct and apparently separate, yet certainly connected by the wing of the partial rachis, about five pairs before their distinctness is lost in the apical portion of the pinna, broad and blunt at the apex, narrow at the sessile base, and slightly broader upwards nearly to the apex, so as to render the circumscription of each pinnule obscurely pyriform or obovate, on

each side they usually have three strongly developed ascending teeth, and are also tri- or bidentate at the apex; the teeth themselves are also, in some of the most luxuriant and most developed specimens, bifid: the midvein in each pinnule is distinct and slightly sinuated; the lateral veins are alternate, unbranched, and each bears a circular cluster of capsules halfway between its base and apex: scales small, concolorous, pale brown, scattered sparingly over the general and partial rachides, but, as usual, larger and more numerous towards the base of the frond.

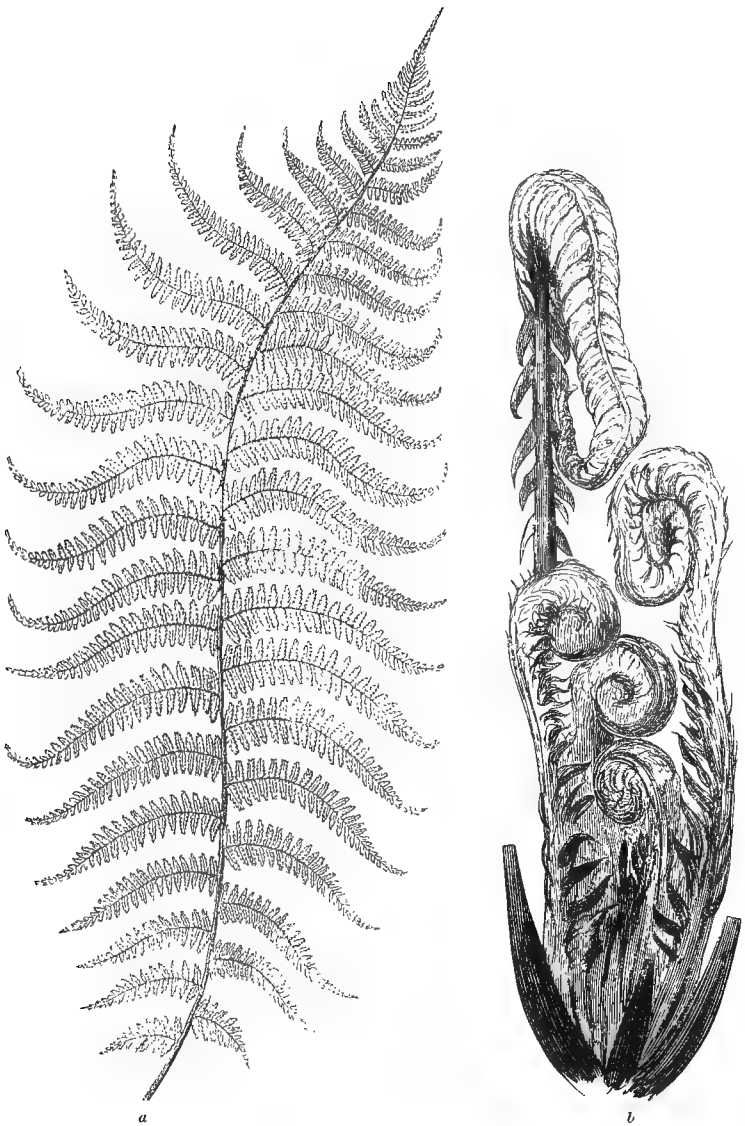
In size this fern is rather diminutive; its fronds frequently attain a length of twelve inches, but its average length is seven inches: it fruits freely, even when not more than three inches in length. On comparing this description with that originally published in the 'Phytologist,' it will be seen that several discrepancies occur: of course, the later purports to be the more correct.

Varieties.

None observed: great pains have been taken to discover abnormal forms, or any forms that would indicate an approach to described species, but it is remarkably constant in all its characters.

Culture.

Both species of Pseudathyrium grow freely in cultivation at York and Worcester; and I am indebted to my friend, Mr. Westcombe, for plants of each, which I have wedged between pieces of free-stone, filling the interstices with sandy peat: the crowns look healthy, but it is too early at present to presume on success, and far too early for me to give any instructions about culture.



LADY FERN, (*a, one-eighth the natural size*).

Characters.

Genus.—Athyrium. Caudex large, massive, persistent, its growing extremity always composed of a most obvious crown of undeveloped fronds: pinnæ with the first upper pinnule as large as or larger than the first lower, neither conspicuously larger or longer than the second and succeeding pinnules: mid-vein of each pinnule distinct; lateral veins alternate, always branched, running towards each tooth of an ultimate division, but ceasing before its apex: clusters of capsules seated on the anterior branch, and on the anterior side thereof, the line of their attachment somewhat crescentic: *involucre very constant and distinct, its attachment also somewhat crescentic, its anterior margin raised, free, split into capillary segments.*

Species. — Filix-femina. Fronds lanceolate, pinnate, very fragile, and early deciduous: pinnæ pinnate.

Synonymes, Figures, &c.

Polypodium Filix-femina, *Linn. Sp. Pl.* 1551; *Lightf. Fl. Scot.* 673; *Huds. Fl. Ang.* 458; *With. Arr.* 778.

Polypodium Rhæticum, *Linn. Sp. Pl.* 1552.

Polipodium Filix-femina, *Bolt. Fil. Brit.* 46, t. 25.

Aspidium Filix-fœmina (*Swartz*), and Aspidium irriguum, *Sm. E. F.* iv. 295-6, *E. B.* 1459, and *E. B. S.* 2199.

Asplenium Filix-fœmina (*Bernh.*), *Mack. Fl. Hib.* 342; *Hook. and Arn.* 571.

Athyrium Filix-fœmina (*Roth*), *Newm. F.* 420; *Bab.* 413.

I have felt so great difficulty in giving, by a figure, any satisfactory idea of the beauty of this fern, that I refrain from comment on the failures of other depictors. The genus of the lady fern has been a source of trouble and confusion to our botanists. Lightfoot, Hudson, Withering, and Bolton make it a Polypodium; Smith, an Aspidium; Hooker, an Asplenium; Babington, an Athyrium: and all, as I conceive, with equal propriety. Filix-femina may readily be distinguished by its elongate and somewhat sausage-shaped clusters of capsules, covered by a similar-shaped involucre, with its fringed free

margin: the attachment of the clusters describes a concave, rather than a direct line, as in Asplenium, and may be called crescentic. From Hemestheum, Lastrea, Lophodium and Dryopteris, it differs in having the clusters of capsules linear rather than circular, attached to the side rather than to the back of the vein, and the involucre which covers them attached longitudinally rather than transversely. Whether it be distinct from Pseudathyrium is a graver and more difficult question: my own inclination is to unite them, but supposing this the philosophical solution of the question, how are we to manage the generic name? The species of Pseudathyrium are emphatically excluded from Roth's genus Athyrium, by that learned author's definition of the involucre; and the species of Athyrium cannot be comprised in the genus Pseudathyrium, because *that* is distinguished by the absence of all involucre. Again, the two genera will not blend in one, because Roth's type-species of Athyrium is Asplenium fontanum, and his second species Asplenium Halleri. Anticipating the time when characters founded on the absence, presence, size, or form of an involucre among Filicaceæ, will be regarded as of no higher importance than those founded on the absence, presence, size or form of a petal among Ranunculaceæ, I cannot but also anticipate the eventual union of plants so similar in habit as Filix-femina and alpestre, in a genus to which a new name may perhaps be given. The difficulty, in such an arrangement, lies in releasing the botanical mind from the cramping trammels which it has so long regarded as necessary. It is impossible for botanists to neglect the involucre; its characters are not only patent and manifest, but, what is a matter of still greater importance, are susceptible of perspicuous definition. Still, if the botanist seek to found on its variations higher groups than little clusters of species, which, like those known under the names of Ilvense, fragile, aculeatum, dilatatum, Filix-mas, or Filix-femina, may or may not be divided into species at the option or caprice of each successive author, he will find himself inextricably involved in the most tangled and unnatural combinations.

With regard to the genus Athyrium, as composed by Roth of two groups, I am clearly of opinion that it cannot stand; the fontanum group and the Filix-femina group will not

harmonise: then if we restrict the genus to the typical or fontanum group, we cannot, by Roth's definition, separate them from the normal Asplenium; and we have no right whatever to restrict the genus to the Filix-femina or abnormal group, because that would be a palpable perversion of the author's meaning and intention.

Geographical Range.

All the forms hereafter mentioned as found in Britain, occur in every country of Europe; and others, very similar, have been found in Africa, Asia, Australia, and the United States of America. From the last-mentioned country, my kind correspondents have sent me three supposed species; but whether these are really distinct from ours, and from each other, I can scarcely venture to pronounce, more especially as the question of species and varieties among our own forms of this fern, is at present undecided.

In Britain, the lady fern seems to claim precedence in beauty over every other species. The exquisite grace of its habit, the elegance of its cutting, and the brilliant delicacy of its colour, combine to render it an object of general admiration. It may, perhaps, require some knowledge of kindred species, fully to understand the peculiarities which unite in giving to this fern its superiority over the rest; but dull indeed must be the perception, and cold the heart, that fails to appreciate its excessive loveliness. It is distributed more or less abundantly throughout the British Islands, its favourite resort being moist and warm woods; but it does not shrink from the exposure of open moors and naked hill-sides, and, if sheltered by masses of weather-worn rock, its delicate fronds may often be found developing their fragile pinnules amid the inclement blasts of our Scottish Highlands. In Ireland it is more abundant, although less beautiful, than in England: it there abounds on all the bogs, and is used as packing for fish and fruit, as we see the common brakes employed in this country. On landing at Warren Point, near Newry, I was rather surprised to see what quantities of it were employed in packing the herrings there exhibited for sale.

Description.

The radicles are black, fibrous, and wiry: the caudex is very large, and its position erect; it sometimes rises several inches above the surface of the ground; in one instance I have seen it more than a foot in height, thus evincing a considerable proximity to the tree ferns of tropical countries: Dr. Ball, of Dublin, showed me a plant of Filix-femina in a Wardian case, in which this peculiarity was very remarkable.

The fronds make their appearance in May; at first their vernation is circinate, but as they advance the apex becomes free, and hangs down, assuming the appearance of a shepherd's crook (fig. *b*, page 207): the form of the frond is lanceolate, and regularly pinnate: the pinnules are simply toothed, or pinnatifid, or pinnate: the stipes varies from a quarter to a third of the entire length of the frond, and is swollen at the base; it has numerous elongate blackish scales, which are particularly abundant at the base, and more scattered, smaller, and scarcely observable on the rachis: both stipes and rachis are frequently tinged with purple and red; in some instances I have seen them assuming almost the colour of coral.

The midvein of the pinnules is waved; the lateral veins are forked shortly after leaving the midvein, and each branch runs into one of the teeth, but ceases before actually touching the margin: the anterior branch of each bears on its side, about midway between the midvein and margin, a linear cluster of capsules: the anterior free edge of the involucre is split into a series of capillary segments. The frond is extremely tender and fragile, and withers almost immediately on being gathered.

Varieties.

In treating of varieties, I shall adopt the same plan with the *lady* fern as I have done with the *gentleman*. Not being fully convinced that the named plants are really species, I cannot conscientiously so denominate them: the difficulty, as in Filix-mas, being not in the want of distinctness between extreme forms, but in the multiplicity of intervening individuals.

1. Babington's Lady Fern: Athyrium convexum: Athyrium Filix-femina, var. *convexum*.

Synonymes &c.

Athyrium rhæticum, *Roth, Flor. Germ.* iii. 67; *Newm. N. A.* 26; *Moore*, 136.
Athyrium Filix-femina, *var.* convexum, *Newm. F.* 245.
Athyrium Filix-fœmina, α., *Bab.* 413.
Athyrium convexum, *Newm. Phytol. App.* xiii.
I think it preferable to abandon the Linnean name of rhæticum, for the reason I have already stated; although I am willing to admit that it may possibly belong here.

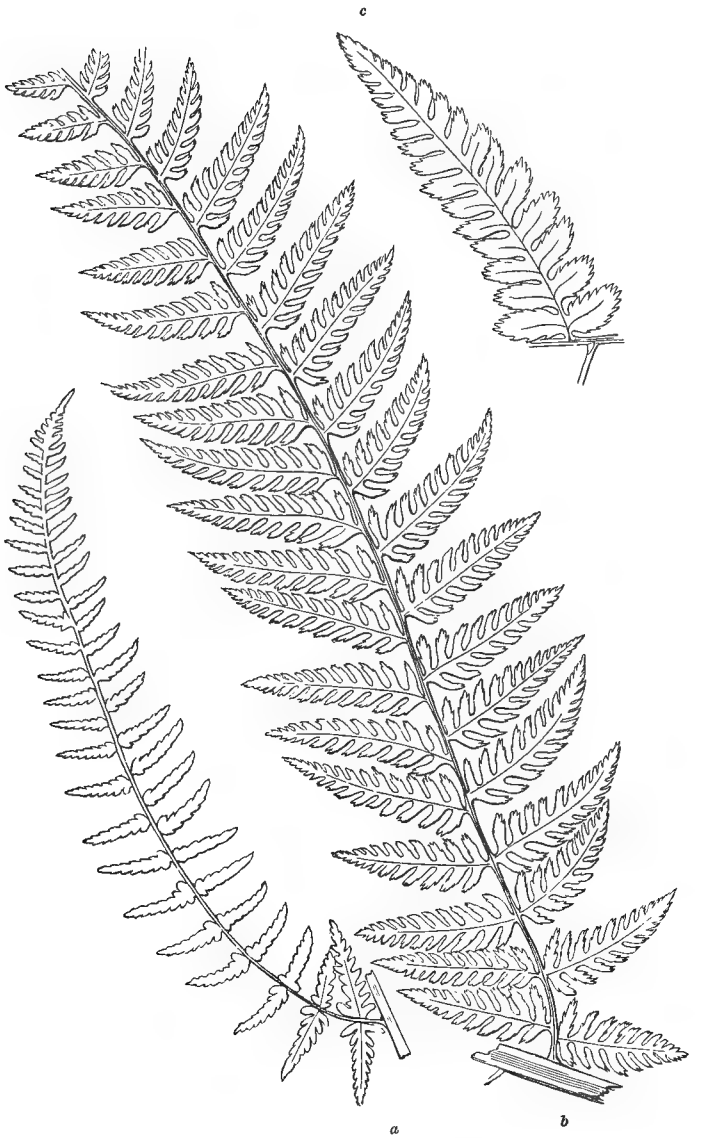
Geographical Range.

This fern is common in France and Germany, and I have no reason to doubt its general distribution on the continent of Europe.

In Britain it rather affects exposed than sheltered situations. I have observed it in Herefordshire, Gloucestershire, Surrey, Sussex, and Kent: it is less abundant, or less observed, than the form next to be described.

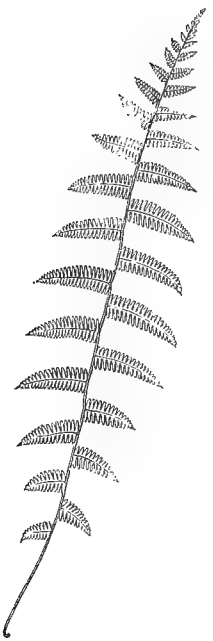
Description.

Radicles very stout and strong, adhering to the soil with great tenacity: caudex very large and stout, always composed of a great number of crowns, from which the fronds, rising simultaneously, appear totally without symmetrical arrangement: stipes short, very stout just above its base, and appearing almost inflated, and there bearing a few long, pointed, brown scales, which are more or less tipped with black: frond of moderate size, pale yellow-green, erect, rigid, linear-lanceolate, pinnate: stipes and rachis quadrangular, semipellucid, and often coloured with purple or red: pinnæ distant, at first ascending,



Pinnæ of Athyrium Filix-femina, *a*, convexum, *b*, incisum, *c*, molle, (*natural size*).

then spreading, and finally deflexed, extremely acute, their midrib not winged: pinnules distant, very narrow, linear, entirely unconnected, their margins convolute, (fig. *a*, on the preceding page, represents a pinna): clusters of capsules subrotund, close to the midrib of the pinnule, and finally covering their under surface, and themselves partially covered by the convolute margin of the pinnules.



The description of Athyrium rhæticum, *var.* minus, of Roth (Flor. Germ. iii. 68), agreeing exactly with Sir J. E. Smith's specimen of Aspidium irriguum, but scarcely with that author's description, appears to me to be merely a seedling plant. Smith admits that his species was "raised originally from seed," and that "after long cultivation it considerably approaches Filix-femina." There is nothing to show to which form of Filix-femina this elegant seedling belongs, but it certainly most nearly resembles Athyrium convexum: a figure is given in the margin.

2. The Linnean Lady Fern: Athyrium incisum: Athyrium Filix-femina, var. *incisum*.

Synonymes &c.

Polypodium incisum, *Hoffm. Deutschl. Fl.* ii. 6.
Athyrium Filix-femina, *Roth, Fl. Germ.* iii. 65.
Athyrium Filix-femina, *var.* incisum, *Newm. F.* 243.
Athyrium Filix-fœmina, *β.*, *Bab.* 413.
Athyrium incisum, *Newm. Phytol. App.* xiii.
Athyrium Filix-fœmina, *α.*, *Moore*, 139.

Description.

Caudex very large and stem-like, very enduring: stipes a fourth part as long as the frond, scarcely incrassated at the base, somewhat scaly: rachis rarely in the slightest degree pellucid, sometimes purplish: fronds very large, suberect, subrigid, dull green, lanceolate, pinnate: pinnæ broad, sublinear, acute, distinctly pinnate, their midrib winged, (fig. *b*, page 213): pinnules large, long, gradually acute, deeply incised or lobed, each sinus penetrating almost to the midrib: lobes serrated or dentate, their margins flattened: clusters of capsules elongate, approximate, their arrangement unsymmetrical, crowded.

Geographical Range.

General: it requires only damp vegetable soil, shade, and absence of molestation.

3. Schreber's Lady Fern: ATHYRIUM MOLLE: ATHYRIUM FILIX-FEMINA, var. *molle*.

Synonymes &c.

Polypodium molle, *Schreber, Spic. Flor. Lips.* 70; *Ehrh. Crypt.* 9; *Hoffm. Deutschl. Flor.* ii. 6.
Athyrium molle, *Roth, Flor. Germ.* iii. 61; *Newm. N. A.* 26; *Phytol. App.* xii.
Athyrium Filix-femina, *var.* molle, *Newm. F.* 242.
Athyrium Filix-fœmina, γ., molle, *Bab.* 413; *Moore*, 139.

Description.

Caudex comparatively small, as well as the entire plant: stipes very short, scarcely incrassated towards the base: the frond lax, flaccid, bright green, lanceolate, much narrowed

below, pinnate: pinnæ scarcely ascending, approximate, flattened, pinnate, subpinnate, or sometimes only pinnatifid (see figure *c*, page 213), the lower ones very short: pinnules blunt, serrated, not divided or lobed, sessile, adnate or decurrent, always connected by the wing of the midrib: clusters of capsules in a series on each side of the midrib of the pinnule, and *very near it.*

Geographical Range.

Common in damp and very dense woods. Dr. Dickie is said to have found it in a sea-cave at Aberdeen, and I am indebted to Mr. Moore for the sight of a frond labelled as from this locality.

A *fourth* form has been supposed to exist in England.

Synonymes &c.

Asplenium Filix-fœmina, *β.*, latifolium, *Hook. and Arn.* 574.
Athyrium Filix-fœmina, *δ.*, latifolium, *Bab.* 413.
Athyrium Filix-fœmina, *β.*, latifolium, *Houlston and Moore, Gard. Mag. of Bot.* iii. 262; *Moore,* 139.
Athyrium ovatum, *Newm. Phytol.* iv. 368 (excl. syn.), *Phytol. App.* xii. (excl. syn.)

The two individual roots to which these synonymes belong have obtained much attention from English botanists: my own opinion respecting them has undergone a complete change. The plants are diseased and malformed, and consequently are not to be treated as having a botanical existence. Mr. Hort was the first to point out the true state of the case; but Mr. Watson's account, as cited below, is more concise and sufficiently explicit. Mr. Wollaston believed he had seen the plant frequently in the Lake district, and hence I concluded that the malformation very observable in the specimens I possess, was confined to those specimens; whereas I now believe that disease occasions, and malformation constitutes, the diagnostics

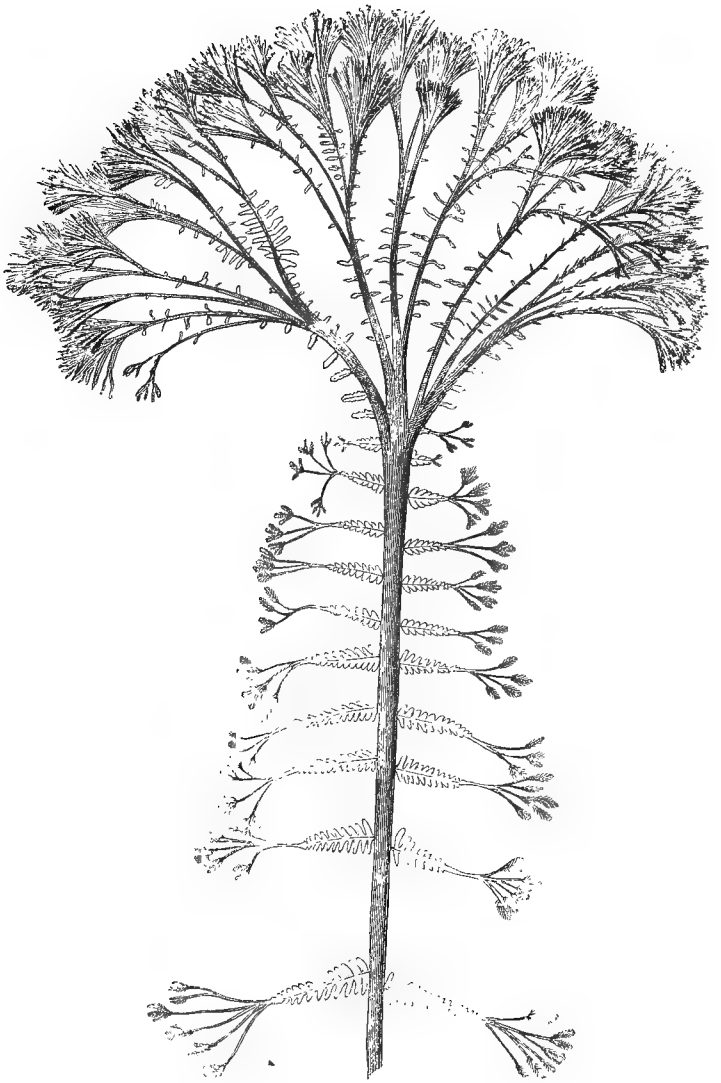
of the plant. "In the 'Appendix to the Phytologist for 1851,' Mr. Newman distinguishes this into four species, — ovatum, molle, incisum, convexum. The three latter are familiar and passably well marked varieties, perhaps even species. The first of the four is the Athyrium Filix-fœmina var. latifolium of Babington's Manual. To my eyes it appears more correctly to be designated a casual variation, or even monstrosity, than a variety. On seeing the fronds of it in the herbarium of Sir W. J. Hooker, I wrote this opinion of them to Mr. Newman, and was not sorry to find shortly afterwards (Bot. Gaz. iv. 155) that Mr. Hort had arrived at a very similar conclusion, independently, and on an actual inspection of the living plant in its native station; for it seems there is now only one root left, although it is stated that there were two roots originally. We might soon multiply our botanical species ten-fold, if it were admissible to make species on single plants in an abnormal condition of health or luxuriance." — Cyb. Brit. iii. 273. I accept these observations as perfectly satisfactory, agreeing with them in every particular.

Geographical Range.

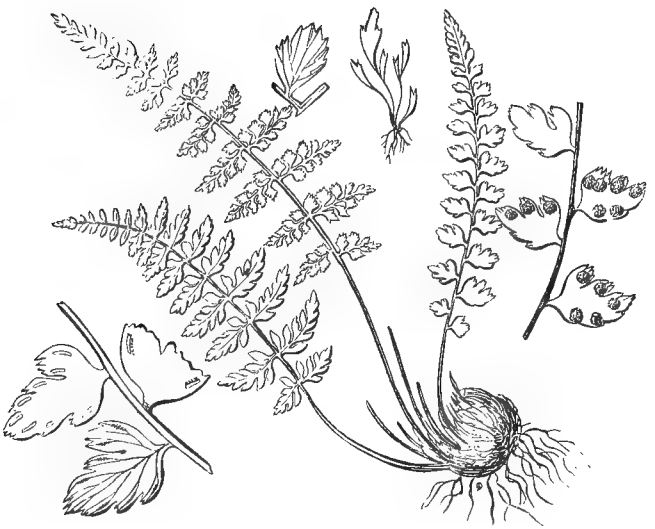
Found near Keswick by Miss Wright, to whom, as well as to Miss Beever and Mr. Babington, I am indebted for specimens.

Culture.

No fern is more desirable, as a garden ornament, than the lady fern. The soil should be light and peaty, and the supply of wet can scarcely be too abundant: the roots will bear constant submersion during the summer season, when a succession of fronds is in course of development. In a greenhouse, it should have a large pot, and a deep feeder filled with water. The monstrous forms of the lady fern are great favourites with cultivators. One, of which I have introduced a figure in the following page, is very beautiful: it occurs in several places in Ireland. I am indebted to the late Mr. Ogilby, Dr. Mackay, and Mr. Moore, for specimens.



A monstrosity of Athyrium Filix-femina.



HUDSON'S SPLEENWORT, (*one-fourth the natural size*).

Characters.

Genus.—ASPLENIUM. Midvein distinct; lateral veins simple or branched: involucre linear, attached to the side of the vein, its free margin sometimes jagged, but not split into capillary segments.

Species. — LANCEOLATUM. Stipes shorter than the frond: frond semierect, lanceolate, pinnate: lowest pair of pinnæ shorter than the second pair, all pinnate or pinnatifid: clusters of capsules at first linear, afterwards circular, distant from the midrib.

Synonymes, Figures, &c.

Asplenium lanceolatum, *Huds. Fl. Ang.* 454; *With. Arr.* 770; *Sm. E. F.* iv. 311, *E. B.* 240; *Sprengel, Syst. Veg.* iv. 88; *Franc.* 49; *Moore*, 152; *Newm. N. A.* 27, *F.* 219, *Phytol. App.* x.; *Hook. and Arn.* 573; *Bab.* 414.

Asplenium obovatum (Vivares), *Guss. Pl. Rar.* p. 376, tab. 64; *Spr. Syst. Veg.* iv. 88.

Asplenium Forsteri, *Sadler, De Fil. Ver.* 32, teste Sprengel, but Sadler denies this.

The only tolerable figure of this fern with which I am acquainted, is in Gerarde's Herbal, (Ger. Em. 1135): that in 'English Botany' (t. 240) is more like Asplenium fontanum; and that in Mr. Francis's 'Analysis of British Ferns' (plate 5, fig. 2), rather resembles Cystopteris fragilis than the present plant. I do not know Bolton's figure (Fil. Brit. tab. 17, 2), referred to by Withering.

It is one of those species that has almost escaped all confusion in nomenclature: we are indebted to Hudson (Flor. Ang. ii. 454) for describing and naming it as a distinct species, and nearly all subsequent authors have adopted his name. It must, however, be observed, that our plant is described by Gussone under the name of Asplenium obovatum, and by Sprengel under both names, lanceolatum and obovatum. It is not the Asplenium lanceolatum of Hoffmann (Deutschl. Flor. ii. 12), an error judiciously pointed out by Weber and Mohr (Bot. Tasch. 41), that plant being nothing more than a variety of A. Adiantum-nigrum: these authors also correctly observe that A. lanceolatum has never been found in Germany. It appears that our plant was well known to Ray, who describes it as "Filix elegans Adianto nigro accedens, segmentis rotundioribus," — (Syn. 127). The only habitats he gives are, first, on the authority of Sherard, "rocks on the north side of the Isle of Jersey;" and, secondly, on the authority of Bobart, "the porch of Adderbury church, in Oxfordshire:" he also adds that it has been found in England by Mr. Woodward, but gives no more precise information.

Geographical Range.

Its European range is very limited. Sadler gives it as a native of France, but it does not appear in the 'Flore Française.' It certainly occurs in Sicily, Italy, and Portugal. Mr. Watson informs me that he found it in Fayal, one of the Azores, and that Dr. Lemann collected it in Madeira.

In Great Britain its range is extremely limited, and its localities strangely diversified as regards altitudinal and geological conditions. It is entirely absent, as far as my information extends, from Scotland, Ireland, and North and Central England. In North Wales it occurs on several high and exposed localities; for instance, in Caernarvonshire, upon the highest range between Llanrwst and Capel Cerig, accompanied by A. septentrionale.

Caernarvonshire.—Mr. Wilson informed me that in 1843 he gathered a few fronds of this fern near my Llanrwst station for Asplenium septentrionale, and that it was first observed there by his brother, Mr. H. Wilson, two years previously. Mr. E. T. Bennett also found it within this county, on rocks above Tremadoc; and again plentifully on Carry-y-Imbill, a bold and almost insulated rock at the entrance of Pwllheli harbour.

Merionethshire. — The vicinity of Barmouth seems a very favourite locality for this fern. Before I was at all acquainted with ferns, I found it in profusion on an old stone wall between Barmouth and Dolgelly, and was struck with its similarity to, yet distinctness from, Asplenium Adiantum-nigrum. I afterwards found it in many localities near Barmouth, particularly on rocks close to the road, on the left hand leaving the town for Dolgelly. I also found it in two other stations in this county; the first on some rocks on the right hand of the road between Tan-y-bwlch and Aberglaslyn, and the second on a rock close to Aberglaslyn. Mr. S. Thompson, guided by my record of these localities, subsequently found half-a-dozen roots in the first of them.

Pembrokeshire. — Mr. Lees informs me that he found it on Ramsay Island, opposite St. David's, on rocks a little south of the only habitation on the island.

(Oxfordshire. — Adderbury Church, according to Bobart: doubtless an error).

Gloucestershire.—Mr. Lees informs me that he found it on a wall at Beechly, near the junction of the Severn and the Wye. Oldbury and Court Woods have been published as stations; Mr. Watson adds Pennant Rocks, near Stapleton, on the authority of Mr. Thwaites; and Mr. Thwaites himself has published the following note in the 'Phytologist:'— "Mr. J. W. Ewing, of Norwich, who resided here for some time a few years ago, discovered the plant growing on a bank at Stapleton, about three miles from Bristol, and pointed out the spot to me. Not paying much attention to the ferns at that time, the circumstance escaped from my memory, until reminded of it by a friend who was with us at the time. I have recently revisited the spot, and again found the plant, but growing there very sparingly; however, by searching very diligently, day after day, the rocks in the

immediate neighbourhood, I discovered it in one or two other places, and in one of these abundantly, covering the dry surface of a rock completely sheltered from rain; and, though its roots are almost exposed, and a slight pull detaches it from the rock, it grows in the greatest luxuriance, one frond which I gathered measuring eighteen inches in length. I have observed, in all the fronds of this fern which I have gathered, that the rachis is, throughout its entire length, furnished with linear scales, a character which best distinguishes it in all its forms, and even in its very young state, from Asplenium Adiantum-nigrum." — Phytol. i. 75. I am indebted to the Botanical Society of London for a very beautiful series of specimens collected by Mr. Thwaites in this locality; and Mr. Thwaites has most obligingly sent me his own magnificent specimens for inspection.

Devonshire.—The Rev. W. S. Hore has obligingly sent me specimens, accompanied by the following habitats: — Morwell Rocks, on the banks of the Tamar; rocks on the Tavy, opposite Virtuous Lady mine; rocks near Cann Quarry, on the banks of the Plym; and upon a damp mud wall at Buckland Monachorum. In addition to some of these localities, Mr. Ralfs informs me he has found it near Tavistock, and by the sea at Salcombe. I am indebted to Miss Griffiths and Mr. Beynon for specimens from Torquay, where it seems first to have been observed by Mr. Beynon in 1842, deeply seated in the interstices of a stone wall, of loose open construction, and having a southerly aspect, not far above high-water-mark, near the mouth of a small brook about half a mile from the town.

Cornwall.—I am indebted to Mr. Greenwood for some fine specimens gathered near Penzance. Mr. Ralfs informs me it is common in many places near Penzance and St. Ives. Mr. Watson gives me the former of these localities. Mr. D. Peirson informs me he has found it at the Manacles, the Logan Rock, &c. and Mr. F. T. Bennett says he has found it on St. Michael's Mount, and that it is exceedingly abundant on hedge-banks in the neighbourhood of Penzance.

Sussex.—I am indebted to Mr. S. L. Howard for a specimen found on the High Rocks, Tunbridge Wells, and to Mr. E. Jenner for others from the same station: under the guidance of the last-named gentleman, I had the pleasure of seeing it growing here in August, 1843. Mr. Borrer and Mr. Jenner have also observed it on rocks in Eridge Park.

Kent. — I am indebted to Mr. E. Jenner for specimens from rocks facing the High Rocks, near Tunbridge Wells; and, conducted by that gentleman, I had the pleasure of seeing it still growing there in August, 1843. A stream running between the two series of rocks separates Kent and Sussex, and the fern grows on both sides of the stream.

Channel Islands.—"The next plant to which I directed my attention was Asplenium lanceolatum, as I had found more trouble in growing this plant, either in or out of a case, than with most other ferns, either British

or foreign. This plant is far more abundant in the western than in the eastern part of the island [Jersey]; and, somewhat to my surprise, I found it flourishing under very different conditions of light and moisture. Near Grosnez, it is found growing in the crevices of the stone walls, fully exposed to the blaze of the sun, scarcely attaining, however, the height of more than one or two inches, and with very crisp and curled fronds. It attains its greatest development on the top of densely shaded sandstone banks at St. Aubin's, where its fronds are a foot in height, and the soil very dry; and likewise in the inside of wells, one or two of which were completely lined with it, where it must have been growing undisturbed for years, from the great number of fronds springing from a single root. One specimen that I gathered, in the inside of a well between Roselle and Boulay Bay, had a hundred and twenty more or less perfect fronds upon it, besides portions of the footstalks of sixty or seventy others. These fronds were twelve or thirteen inches in height. In all cases the plants are surrounded by a mild and humid atmosphere, free from soot or dust." — Mr. Ward, in Phytol. iv. 1090.

Description.

The radicles are black, very long, slender, and penetrating; in the fissures of rocks they often run to a great depth, and the plant becomes so completely and firmly wedged that it is a task of great difficulty to obtain a living plant from such situations. The caudex is brown, tufted, and densely covered with bristle-like scales; similar scales are also scattered here and there on the stipes. The young fronds make their appearance in May, arrive at maturity in August, and remain uninjured throughout the winter; and, except in seedling plants, they are always fertile. The form of the frond is various; in some situations it is of erect growth, nearly linear, and simply pinnate, the pinnæ being stalked and lobed: in this state seed is abundantly produced, and the masses, when full grown, are perfectly circular. Of the three entire fronds represented in the illustration at page 219, that to the right hand is intended for this form, and the portions of fronds to the right and left show the situation of the veins and the mode of fructification: every part is perfectly flat, and the entire frond rigid. A second form, of pendant growth and larger size, is more lanceolate: the pinnæ are pinnate: the pinnules stalked, serrated, and some-

what quadrate: the fronds often measure a foot in length, and sometimes fifteen and even eighteen inches: they usually issue from dark holes or crevices, or depend from the roofs of sea-caves; and the lower pair of pinnæ are often bleached, of small size, weak and imperfect: the surface of the frond is generally flat: the middle frond of the three on page 219 represents this form, and the detached pinnule immediately adjoining it shows the veins and incipient involucres. A third form is of nearly erect growth, but bends over at the extremity; and the entire frond, together with each individual pinnule, possesses such a rigid and inflexible convexity, that it is next to impossible to flatten it by pressure: the frond to the left on page 219 is intended to represent this state, but the convexity is not expressed. The lateral veins are branched, a branch running to the extremity of each serrature: the clusters of capsules are attached near the *extremity* of the veins, and somewhat alternately, one branch bearing a mass and the next being without one: each cluster is at first elongate and linear, and covered by a linear, white involucre; this involucre soon disappears, and the clusters generally become nearly circular and somewhat crowded: they are sometimes so large and crowded when ripe as to be quite confluent.

Culture.

In a common flower-pot, this fern grows most luxuriantly. Select a small pot, in proportion to the size of the plant, fill the bottom to the depth of two inches with small pieces of charcoal; then prepare a mixture of charcoal, in pieces not larger than a hazel-nut, clean silver sand, fibrous peat chopped in small pieces, sand-stone in small pieces, and light friable loam sifted fine, so as to get rid of the pebbles which so frequently occur in loam: these six ingredients, in equal parts, should be thoroughly mixed and passed through a coarse sieve. Hold the fern in the middle of the pot, with the radicles spread as widely and loosely as possible, and with an iron spoon fill in the mixture carefully and equally, shaking it gently down until the pot is full. Stand the pot in a feeder constantly full of water, but supply no water on the fronds or the surface soil.

BLACK SPLEENWORT, (*one-half the natural size*).

Characters.

Genus.—ASPLENIUM. (See page 219).

Species.—ADIANTUM-NIGRUM. Stipes as long as the frond, dark purple or black at the base: frond elongate-deltoid, pinnate: lowest pair of pinnæ always longest; all the pinnæ pinnate; ultimate divisions obtuse: clusters of capsules linear, approximate to the midrib.

Synonymes, Figures, &c.

Asplenium Adiantum-nigrum, *Linn. Sp. Pl.* 1541; *Lightf. Fl. Scot.* 666; *Huds. Fl. Ang.* 454; *Bolt. Fil. Brit.* 30, t. 17, 3; *With. Arr.* 770; *Sm. E. F.* iv. 310, *E. B.* 1950; *Mack. Fl. Hib.* 342; *Franc.* 49; *Newm. N. A.* 27, *F.* 255, *Phytol. App.* x.; *Hook. and Arn.* 573; *Bab.* 414; *Moore*, 155.

There are good figures of this fern in the 'English Botany,' in Bolton's 'Filices,' and in many of the continental works. Concerning its nomenclature, there appears no difference of

opinion, the name of Asplenium Adiantum-nigrum being assigned to it by general consent.

Geographical Range.

It has been found in every country of Europe, in North and South Africa, in Madeira, Teneriffe, and many other Atlantic Islands. A species very similar to the common English form of this plant has been discovered in the United States, but is of such great rarity that the opportunity of forming an opinion on the subject, from a careful comparison of a sufficient number of specimens, has not yet been afforded me. In the absence of such materials I may cite the opinion of Dr. Torrey, who, as Mr. Boott informs me, considers the American plant distinct as a species: it is described by Beck under the name of Asplenium montanum (453), and by Michaux under that of Asplenium Adiantum-nigrum, (ii. 265).

In Great Britain, the black spleenwort is universally distributed, but in some districts far more abundantly than in others: it occurs on rocks as a native habitat, but seems gladly to avail itself of walls, old buildings, ruins and hedge-rows; on ruins it is often very ornamental.

Description.

The radicles are very black and wiry: the caudex tufted, black, and covered with setiform scales: the stipes is extremely smooth, shining, and generally of a black or dark purple colour, at its base are a few scattered pointed scales. The fronds seldom appear before the end of May or the beginning of June; at first their position is nearly erect, but they soon begin to droop, and finally become quite pendulous; they arrive at maturity in October, and continue perfectly green and vigorous throughout the winter, until the ensuing May, or even June: they are nearly always fertile. The form of the frond is triangular, its apex being acute and attenuated: it is pinnate: the pinnæ are triangular, acutely pointed, pinnate, and alternate: the pinnules again are alternate and triangular, and the lower

ones often pinnate or pinnatifid, with the lobes notched; the apices of the ultimate divisions are serrated. The lateral veins in the pinnules or lobes, as the case may be, are irregularly alternate, and are generally forked after leaving the midvein; and one or both branches of this divided vein bears on the side a line of capsules: these are at first covered by a white, linear, narrow, scale-like involucre, also attached to the side of the veins: the clusters of capsules, together with their involucres, are situated rather nearer the midvein than the margin; and the involucres open towards the midvein. As the capsules advance towards maturity, the involucre is lifted up and pushed away from its original situation, and finally entirely disappears; the clusters then become confluent, and their form is lost.

Varieties.

Pinnæ of Asplenium Adiantum-nigrum, (*natural size*).

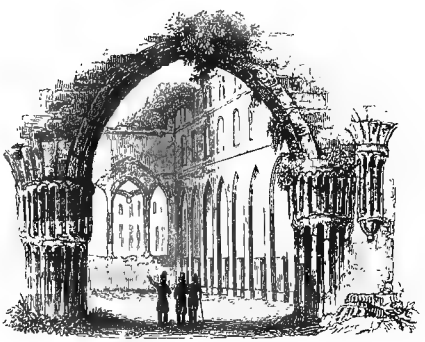
This fern varies greatly in the amount of cutting or division of the frond; but these discrepancies seem to be the result of external circumstances, and not of constitutional difference. I regret to say that I am unable to decide whether several of the continental *names* refer to this species or not; and until this is satisfactorily settled, it seems worse than useless to introduce them when there is no real necessity for their appearance. I am indebted to Mr. Watson for the sight of a beautiful and very large frond from Fairmile, near Cobham, in Surrey; and to Mr. Cheshire, for others from the vicinity of Stratford-on-Avon. The latter gentleman has kindly supplied me with roots, in order that I may study these forms under cultivation: these fine plants differ from the normal form of the species chiefly in their great luxuriance, and their consequent greater amount of subdivision of frond.

Culture.

This is a very ornamental fern for rock-work and walls. It is remarkably enduring and long-lived when in the open air in the country, but it dwindles in a London atmosphere, and does not like the confinement of a greenhouse, much less that of a Wardian case: in the former I have repeatedly found it dying without any apparent cause; and in the latter, I have never known it to thrive. The best mode of cultivation, where the atmosphere is tolerably pure, is to plant it among stones on a declivity facing the North, and also shaded by hazel-trees: the soil is a matter of no great moment, but it may be observed, as a rule, that light sandy soils are better than heavy clayey ones. In a greenhouse, care should be taken to supply it constantly but not immoderately with moisture. The caudex will survive a good deal of drought, and a good deal of moisture; but the fronds are soon affected by both, but especially by the latter; they turn black, die, and rot, the black spots suddenly appear, increase, and eventually cover the frond, as observed so frequently in potatoes. Other ferns are subject to this decay, but no other exhibits it so frequently. The soil should be chiefly composed of sand, and small lumps of sand-stone should be interspersed.

Economical Uses.

Its medicinal properties have been celebrated by several of the older writers, but little credence appears to have been given to them by modern practitioners: the catalogue of diseases in which it was prescribed, is summed up by Ray in the following passage: — "In tussi, asthmate, pleuritide, ictero, obstructionibus lienis prodesse creditur: quin et ad renum et vesicæ dolores valere, * * * calculos et arenulas expellendo: Matthiolus ad puerorum enteroscelas pulverisatum propinat: Hoffmannus in scorbuticis affectibus commendat."—Syn. 127.



† BORY'S SPLEENWORT.

Characters.

Genus.—ASPLENIUM. (See page 219).

Species.—ACUTUM. Stipes very much longer than the frond, glabrous, black at the base: frond elongate-deltoid, very much divided: ultimate divisions linear, very acute: clusters of capsules linear, very narrow, crowded.

Synonymes, Figures, &c.

Filix minor longifolia, &c., *Ray, Syn.* (ed. 1), 51, 12; "*Pluk. Alm.* 150, *Mant.* 78, t. 282, f. 3," *Ray, Syn.* (ed. 2), 127.

Asplenium acutum, "*Bory, in litt.*" *Willd. Sp. Pl.* v. 347; *Sadler, Adumb. Epiph. Hung.* 28; *Spreng. Syst. Veg.* iv. pars 1, 90; *Szad. A'Mag. Plant.* xi. No. 9; *Sadler, De Fil. Ver.* 31; *Presl, Tent. Pterid.* 107.

Asplenium Adiantum-nigrum, *β.*, *Sm. E. Fl.* iv. 311.

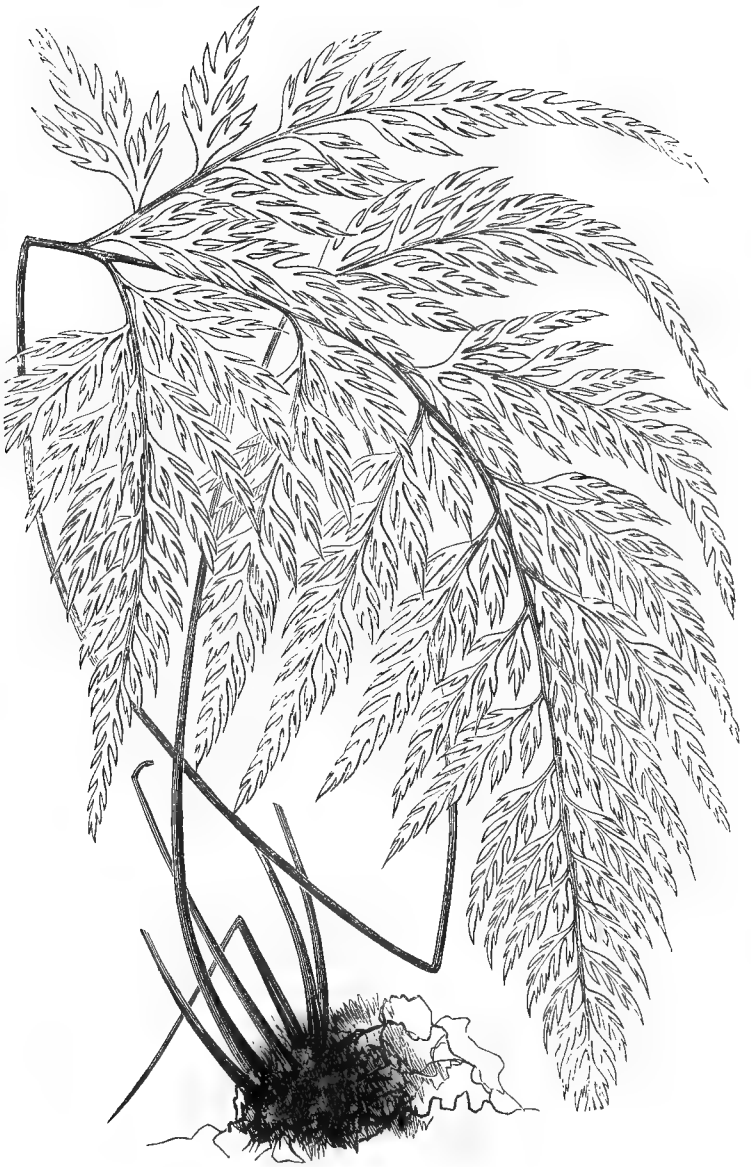
Asplenium Adiantum-nigrum, *var.* acutum, "*Bory, in litt.*" *Newm. F.* 259.

? Asplenium Adiantum-nigrum, *var.* Virgilii, "*Bory, in litt.*"

? Asplenium productum, *Lowe.*

In addition to the authors above cited, Mr. Francis, and the learned authors of the 'British Flora,' also mention this plant, but do not name it either as a species or variety: there seems a probability that it is also the "A. Adiantum-nigrum, *var.* Virgilii," of botanical collectors; but, if so, it is desirable to suppress that name in favour of the earlier one, concerning which no doubt has hitherto been expressed. The same observation applies to a third name, the Madeiran A. productum of Lowe.

For a careful reprint of all that has been written concerning this fern, including the descriptions by Willdenow, Sprengel, and Sadler, the reader is referred to No. 153 of the 'Phytologist,' (Phytol. v. 36).



Frond of Asplenium acutum, (*natural size*).

Geographical Range.

This fern seems to be very abundant and very luxuriant in the Azores, the Cape de Verde and Canary Islands: it occurs less plentifully and less luxuriantly in Portugal, Spain, Italy, Illyria, Istria, Croatia, Sclavonia and Hungary.

In Great Britain, it has only been recorded for three Irish counties:—Down, on the authority of Sherard; Kerry, on the authority of Miss Hutchins, Dr. Taylor, Mr. W. Andrews, Dr. Mackay, Mr. W. Wilson, Dr. Allman, and Dr. Allchin, to whom I am indebted for fronds and a living plant; and Cork, on the authority of Miss Carpenter, to whom I am indebted for the loan of a very fine frond.

Description.

Radicles very strong, black, and wiry: caudex robust, its crown composed of a mass of nearly black bristle-like scales, which totally hide the undeveloped fronds: stipes glabrous, very black at the base, notably longer than the frond, often twice as long; in the figure on the preceding page it is represented of the exact length, and is thrice bent at acute angles, in order to accommodate the figure to the dimensions of the page: frond very ample, elongate-triangular, the apices of the pinnæ, as well as the apex of the frond, being excessively acuminate, or, as Willdenow has it, "*caudatis*, i. e., *longissime acuminatis;*" the effect of the figure would have been greatly improved could the apex of the frond have been represented: the frond, as well as its pinnæ and pinnules, are all pinnate, so that it is one of the most divided of British ferns: the ultimate divisions are linear, toothed, and sharp-pointed, they seem to consist of a midvein and a narrow wing: the clusters of capsules are linear; the involucre is also linear and very distinct: the dorsal surface is green and glabrous, and has the texture very peculiar, having a feel like that of writing-paper.

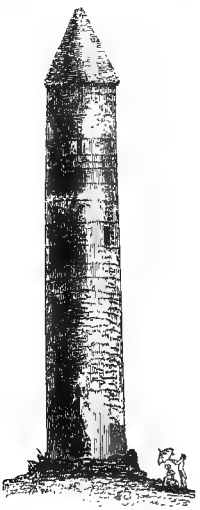
Nothing can possibly be more remote from my purpose, or more prejudicial to my botanical reputation, than the erection of a casual form or variety into a species: but I hope that my

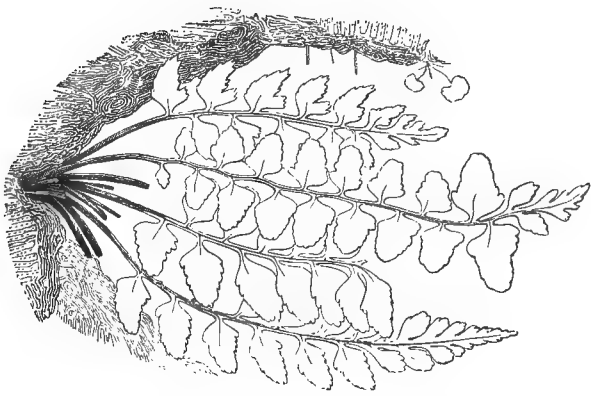
brother-botanists will view this question in its proper light. Asplenium acutum is a species, admitted to be distinct, as I believe, by every continental author who is acquainted with it: it was described as distinct forty-four years ago, and no competent botanist has suggested a doubt of the propriety of the decision at which Willdenow arrived: that eminent botanist, and, long afterwards, Sadler also, compared it with its near ally, Asplenium Adiantum-nigrum; they went carefully into the evidence of its being identical with that fern, weighed fairly and deliberately all the pros and cons of the case, and rejected as untenable the idea of uniting the two. The next point is that I ascertain, beyond any reasonable doubt, that this very Asplenium exists abundantly in the South-west of Ireland. Having satisfied myself on this second point, I proceed to consider whether I shall reject a species clearly and unmistakably characterised by Willdenow, and unhesitatingly adopted by fifty botanists far better than myself. The *onus* of proving the plant a species does not rest with me; but the *onus* of uniting it with another species, if I attempt to do so, must rest with me. I am unable to show that acutum is a form of Adiantum-nigrum, produced by latitude, temperature, soil, exposure, shade, altitude, or other varied conditions, because in all its localities Adiantum-nigrum also exists in its most normal form, and, growing side by side with acutum, remains unchanged. I am unable to show that acutum is a monstrous or diseased plant, because it exhibits all the symmetry and uniformity of parts which indicate health, vigour, and normal condition. I am unable to show that the difference is simply one of amount of cutting or subdivision, because there is also a difference of texture always observable. I am unable to show that acutum returns to Adiantum-nigrum under cultivation; on the contrary, the result of a careful examination of the individual plant which has been supposed to establish this fact is, that the departure from the ordinary acutum is in one direction only, namely, in size; and as discrepancy in size is not urged by any author as a diagnostic between the two nearly allied species, it is not logical to adduce uniformity in size as counter evidence, and a proof of their identity. Even on this subject a few words may be appropriate: Mr. Watson and Mr. Cheshire have found Adiantum-nigrum so large as entirely to remove

magnitude from the list of diagnostics. For all this, I must acknowledge that I am still unsatisfied as to the distinctness of the two species, and adopt them, *first*, because dependant on higher authority than my own: and, *secondly*, because no one on the continent has ventured to call in question the propriety of separating them.

Culture.

I have scarcely any practical experience of this fern under cultivation: its natural conditions may perhaps be best imitated by covering it with glass, and thus affording it that atmospheric moisture which, in the Atlantic islands and in Ireland, tends to produce and mature such hygrophilists as Trichomanes speciosum.





SEA SPLEENWORT, (*the Liverpool plant, natural size*).

Characters.

Genus.—ASPLENIUM. (See page 219).

Species. — MARINUM. Stipes shorter than the frond: frond pinnate: pinnæ attached by a very narrow base, appearing as if stalked, ovate, serrated: clusters of capsules linear, rust-coloured, always separate.

Synonymes, Figures, &c.

Asplenium marinum, *Linn. Sp. Pl.* 1540; *Lightf. Fl. Scot.* 664; *Huds. Fl. Ang.* 453; *Bolt. Fil. Brit.* 26, t. 15; *With. Arr.* 769; *Sm. E. F.* iv. 307, *E. B.* 392; *Mack. Fl. Hib.* 341; *Franc.* 49; *Newm. N. A.* 27, *F.* 275, *Phytol. App.* ix.; *Hook. and Arn.* 573; *Bab.* 411; *Moore*, 159.

Adiantum trapeziforme, *Huds. Fl. Ang.* 460; *With. Bot. Arr. Veg.* 655; but certainly not of *Linn. Sp. Pl.* 1559, as cited by early English authors.

Adiantum trapeziferme, *Berk. Syn.* ii. 309.

There is a good figure of this fern in Bolton's 'Filices' (tab. 15), another in 'English Botany' (392), and a third in Hooker's 'Flora Londinensis' (t. 60).

Among botanists of the present day there is no difference of opinion as to its nomenclature: on the continent of Europe it is but little known to botanists, and in this country all our authors agree in calling it Asplenium marinum. It should, however, be remarked, that the different forms have led some of our older authors to suppose we have two species. One of these is the "Adiantum majus Coriandri folio, Adianto vero affine, pediculo pallide rubente" of Sibbald (Scot. 7), and also the "Adianto vero affinis minor Scotica folio obtuso saturate viridi" of the same author (Id. 8), as quoted in Ray's 'Synopsis' (Syn. 124); and the Adiantum trapeziforme of Hudson (Flor. Ang. ii. 460) and Berkenhout, (Syn. ii. 309): Withering (Arr. Brit. Pl. iii. 769) properly referred this supposed species to Asplenium marinum. The other plant is the "Chamæfilix marina Anglica" of Bauhin (iii. 2, 737) and Ray (Syn. 119), the "Filicula petræa femina seu Chamæfilix marina Anglica" of Gerarde (Em. 1143), and the Asplenium marinum of Hudson, Berkenhout, and all modern botanists.

Geographical Range.

This fern, as its name implies, is essentially a marine species, rooting deeply in the fissures of sea-cliffs, or clothing the roof of sea-caves, in the darkest recesses of which it seems to luxuriate. Its European range appears limited to the coasts of France and Spain: from the 'Flora Rossica,' which embraces the greater part of Europe and Asia, and a large portion of North America, the very name of this fern is absent. It is very luxuriant in Madeira and Teneriffe, and, according to Sadler, has been found in Northern Africa, but I have never yet heard of its occurrence in other countries.

Its range in Great Britain is very extensive, but confined entirely to those counties which are washed by the sea. It will be most convenient to trace its range coastwise.

Commencing with Yorkshire, the late Mr. Samuel Gibson informed me that he found it sparingly on cliffs north of Scarborough.

In Durham, Mr. Watson gives me Marsden Rocks as a locality, on the authority of Mr. Bowman. Mr. Winch says it is also found on rocks near

Marsden Rocks. "Black-hall dean, west of Hartlepool: Rev. J. Dalton. Near Southwick: Mr. Brunton."—'Botanist's Guide.'

Passing into SCOTLAND, we find the following record for Berwickshire, from the pen of Dr. Johnstone: — "Of frequent occurrence on the coast of Berwickshire, commencing on the cliffs above the sandy beds and the Pigeon's Cove, and recurring at intervals even unto the Cove-shore. It is of small size when the cliffs are abrupt and exposed to the sea blasts, but in the shelter of the coves it grows luxuriantly, and the fronds attain a length of 12 or 18 inches. Mr. Hardy sent me the finest specimens I have ever seen from the Rammel Cove. The fern also grows on sandstone rocks by the Tweed, below Lady-kirk House, a station which is about seven miles distant from the sea."—Terra Lindisf. 249. It occurs on both sides of the Firth of Forth, that is, in Lothian and Fife, but I am unable to distinguish in which of the counties on the southern shore of the Firth it ought to be enumerated. In Forfarshire, the late Mr. Gardiner reports it from "caves and crevices of rocks, on the sea-shore about Auchmithie, Redhead,—Messrs. Croall and Kerr. Dysart,—Mr. A. Kerr." Cove, either in Kincardine or Aberdeenshire, is given as a locality; but Mr. Watson thinks that I am in error in giving Aberdeen as a county in which it occurs; (see Cyb. Brit. iii. 278). I have a number of specimens purporting to be from "Sea caves near Aberdeen;" but on writing to the donor, he will not permit me to give his name in opposition to Mr. Watson's authority: this county therefore remains for confirmation. In the 'Flora of Moray,' one station is given for that county. Mr. Watson has a specimen from the eastern coast of Ross, gathered by Mr. Stables. On the western coast I have few localities to record: it grows sparingly in the vertical fissures of the columnar basalt at Staffa; more abundantly, intermixed with Adiantum-nigrum and Ruta-muraria, upon the ancient cathedral at Iona; again in Mull, and also at Oban, in Argyleshire: these I give on my own authority; and it is curious that the record includes every place I have visited on the Scottish coast. Mr. Watson adds Shiant (the Holy Islands), Harris, Isla, Cantire, Arran, Ailsa, Wigton, and Kirkcudbright. At this point we again enter England.

CUMBERLAND.—Mr. Heysham informs me he has found it near Whitehaven; and Mr. Pinder has supplied me abundantly with beautiful specimens, both from this place and St. Bees Head.

WESTMORELAND.—Mr. Pinder and Mr. Hindson inform me they have found it in this county in a sea-cave near Silverdale.

YORKSHIRE. — The late Mr. S. Gibson informed me that it occurs very sparingly on cliffs north of Scarborough.

LANCASHIRE.—I believe Bolton first observed this fern in the Winwick stone-quarry, near Warrington. Mr. Wilson informs me that it still grows there, but is always of small size, and rarely produces fruit: I am indebted

to Mr. Wilson and Dr. Wood for specimens from that locality. Mr. Gibson found it about two miles from Liverpool, on the way to Runcorn; Mr. S. Thompson informs me he has found it at Knot's Hole, the Dingle; and adds that he is also informed, on good authority, that it grows on the red sandstone rock in the village of Newton, on the Liverpool and Manchester railway. Mr. Simpson has observed it abundantly upon the rocks near Heysham, and in a cave at the head of Morecambe Bay.

Cheshire.—I found it on the rocks called the Red Noses, at New Brighton; and Mr. Wilson and Mr. Watson have subsequently given me this as a station. Dr. Wood informs me that "on the rocks of Hilbre Island, at the mouth of the river Dee, on the coast of Cheshire, the species is met with in great quantities."—Phytol. i. 481.

Caernarvonshire.—Mr. Pinder informs me he found it on the Eagle Tower, in Caernarvon Castle; and Mr. Wilson has found it at Orme's Head.

Anglesea.—We learn from Ray that it occurs upon the rocks about Priestholm Island, and at Llandwyn; the Rev. Hugh Davies says it is common on the rocks; and Mr. Watson gives me the South Stack as a locality.

Merionethshire.—I have seen specimens from near Towyn.

Cardiganshire. — In many places: I found it very fine on the castle-rock, and on the castle-wall at Aberystwith.

Pembrokeshire. — Mr. Kippist informs me that he observed it abundantly in several places along the cliffs between Tenby and Saundersfoot; and Mr. Lees, that he found it in deep fissures of the trap rocks at Fishguard, and in caves and cavities of the old red sandstone near St. Justinian's chapel, St. David's, opposite to Ramsay Island, on St. Catherine's Island, Tenby, &c.

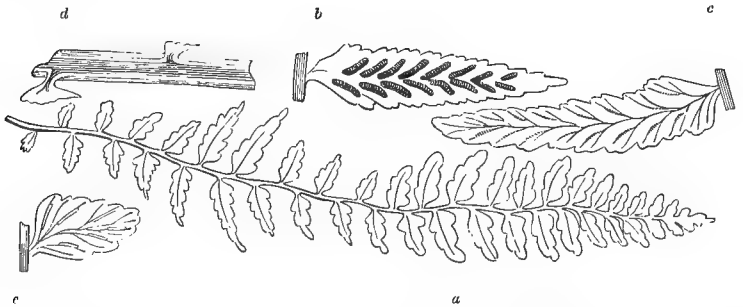
Glamorganshire. — I learn from Mr. Dillwyn and other botanists, that it occurs in the following localities: — Near Neath; Mumbles lighthouse; between the Mumbles and Penyard Castle; near Swansea; near Dunraven; near Oystermouth; on Barry Island, coast of Gower; and plentifully in Bacon's Hole.

Somersetshire. — Mr. Grindon informs me that he found it in a cave by the rocky beach near Clevedon, on the 6th of July, 1842. It formerly grew here in great abundance, and also at Portishead. My kind friend, Mr. Thomas Clark, has given me a plant from Weston-super-Mare, in this county; and my friend, Mr. W. Tanner, has also given me Weston-super-Mare as a locality.

Devonshire.—Miss Griffiths gives me Dawlish and Ilfracombe as localities. The Rev. W. S. Hore informs me it is common in sea-caves; Mr. Ralfs has found it at Torquay and Salcombe. Mr. Beynon informs me that it grows in cavernous fissures of the rocks in many parts of the coast near Torquay; for instance, Liver Mead, Daddy Hole, Mead Foot, and Hope's Nose. Mr. Sparkes observed it in a sea-cave at Babbicombe; and

Mr. Jordan between Dawlish and Teignmouth, and also *at* Dawlish, Teignmouth, and Exmouth. Mr. Hannaford finds it with ovate obtuse pinnæ at Goodrington and Stoke Gabriel Rocks, and with elongate acute pinnæ on Dartmouth Castle.

Cornwall.—In this county the sea spleenwort is abundant and luxuriant. Miss Warren informs me that it grows both on the northern and southern coasts; and that it is particularly fine near St. Ives. Mr. Ralfs says it is fine and abundant at Mousehole. Messrs. Watson, Greenwood, Peirson, H. Christy, &c., have given me numerous other localities, almost comprising the entire coast. The form of the frond in Cornish specimens is more elongate than in those from Liverpool, and the habit altogether different.



a. Cornish specimen of Asplenium marinum, one-eighth the natural size. *b* and *c*. Pinnæ of the same, of the natural size; *b* showing the linear clusters of capsules; *c*, the veins: *d*, a portion of the rachis. *e*. Pinna of the Liverpool plant in a young state, showing the veins and involucres.

Dorsetshire. — "Rocks and cliffs in the Isle of Portland: Sir T. G. Cullum. In Purbeck in various places: Pulteney." — 'Botanist's Guide.' I have seen specimens from Lyme Regis.

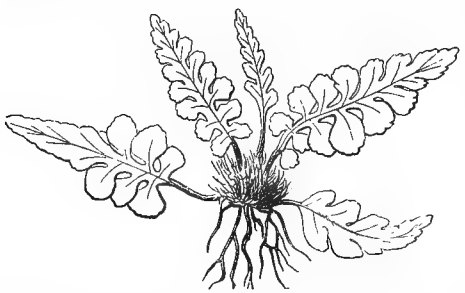
Hampshire.—"Extremely rare in Hants, and only known to me in the single subjoined station, where it is both excessively sparing in quantity and of most diminutive growth. — Amongst masses of rock above the shore west of St. Catherine's Point, beyond Knowle, towards Blackgang, Sept. 12, 1845: Miss Kirkpatrick."—Dr. Bromfield in Phytol. iv. 17.

Sussex. — Ray found this fern about the Castle-rock at Hastings; and I am informed by Mr. Yarrell, Mr. Borrer, and Mr. Jenner, that it still exists in the same locality.

From this locality, passing on eastward and then northward to Scarborough, I have not a single record of its occurrence.

In the Channel Islands it is abundant and luxuriant. Mr. H. Doubleday, in a letter written on his return from spending a few days there, says: — "At a lovely spot on the southern coast of Guernsey, called Petit Bot Bay, I found a large cave, from the roof of which grew thousands of fronds of Asplenium marinum; many of them were two feet, and one thirty inches in length, including the naked part of the stem." Mr. G. Wolsey also observed it during the present year growing abundantly tightly wedged in between the stones of which the water-mills at Petit Bot Bay are constructed: in this locality there are perhaps a hundred plants. The Rev. Mr. Dobree informed Mr. Wolsey that it also grows abundantly in an old well, behind the parsonage-house at Torteral, in Guernsey. Mr. Wolsey found a few plants in the fissures of rocks on the north and east coasts of the Island: at Creux Mahie, the station given by Mr. Babington in his 'Primitiæ Floræ Sarnicæ,' there are only a few weak plants.

In Ireland its localities are far too numerous to be particularized. In my rambles in that beautiful country, I found it on the sea-cliffs whenever I reached the coast: and I believe the Irish botanists have observed it in every county that borders the sea. I must, however, mention one locality that struck me as remarkable: I allude to the lakes of Killarney. As you skirt the upper lake on the way to Kenmare, there is a spot where the rock has been blasted by gunpowder, for the purpose of making a good carriage-way between Turk mountain on the left, and the lake on the right. On this rock the sea spleenwort has thoroughly established itself: the plants are of small size and rather remarkable form, and they are not to be procured without considerable difficulty, the face of the rock being steep, and difficult to climb, and the little plants are very firmly rooted in the fissures. I succeeded after some trouble in detaching two specimens, the largest of which is represented in the margin. I confess I feel rather gratified in the belief, that while it can escape the eye of no botanist who may chance to visit the spot after reading this notice, it will long, by its inaccessible situation, be rescued from extermination. The late Mr. W. Thompson, whose valuable memoranda I have so often consulted while drawing up my lists of Irish localities, informed me that both of the forms figured in this work are of frequent occurrence to the South of Newcastle, in the county Down.



Description.

The radicles of Asplenium marinum are black, wiry, tough, long, and so firmly fixed in the crevices of rock, that it cannot be eradicated without considerable trouble: the caudex is tufted, black, and its crown covered with bristly scales: the fronds make their appearance in June and July, ripen their seed in October and November, and remain perfectly green throughout the year; in August, the fronds of two seasons are equally vigorous, the younger ones being distinguished by their paler colour and immature fructification. The stipes is generally scarcely a third as long as the frond: the frond is linear and simply pinnate: the pinnæ are attached by a narrow base, their forms are various, as will be seen by the figures; two larger than the rest frequently appear near the apex: the pinnæ are connected by a narrow wing running along the rachis, as shown at *d*, page 239. The lateral veins are forked almost immediately after leaving the midvein; the anterior branch bears a long linear cluster of bright rust-coloured capsules; this, when young, is covered by a white membranous involucre, of similar form, which always opens towards the apex of the frond.

Varieties.

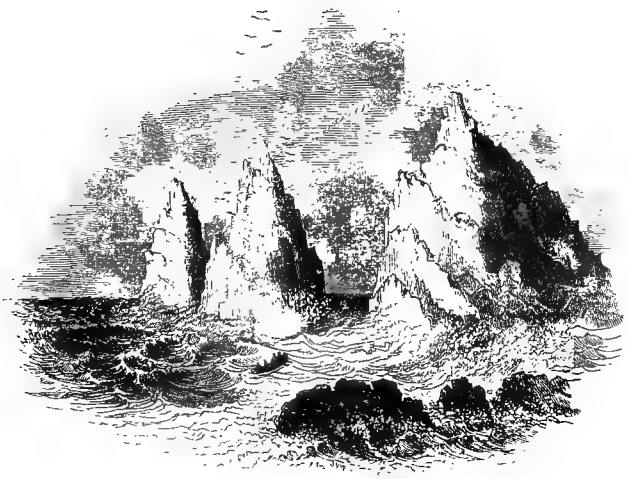
The two forms already spoken of are so intimately connected by a series of intermediate states, that it would be confusing to the inquirer were I to attempt to describe or distinguish them.

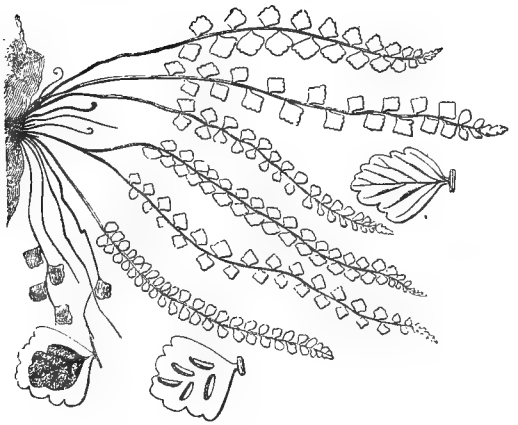
Culture.

This is a most difficult fern to deal with in cultivation, unless carefully protected from exposure: it will thrive luxuriantly in a stove-house, with a moist heat of 70° Fahr., but dies on rock-work, even in the purest air, if denied the advantage of the sea-breeze; this is the more remarkable, since at Newton, Warrington, and Killarney, as recorded in the preceding pages, it has voluntarily forsaken the vicinity of the sea.

My kind friend, Mr. Wollaston, gives me the following directions for cultivating this fern. "The soil should be composed of sandy loam and turfy heath-peat, with a small portion of thoroughly rotten leaf-mould, and it *must* be kept in a greenhouse, or in a frame, or covered by a hand-light." Mr. Wollaston however suggests to me that it might be planted between pieces of stone on rock-work, with a southern aspect, and in a very sheltered situation, protected completely from every ray of sunshine. I find this plant invariably killed by severe frost: I lost every plant in the frost of January, 1854.

In many of its native localities the sea spleenwort is so firmly fixed in the fissures of the rock as not to be removed without the greatest difficulty, and rarely without the danger of inflicting some fatal injury on the caudex and radicles: in other localities it roofs the sand-stone caves, spreading its radicles like a carpet over the soft sandy surface, and may be removed with the greatest ease: under such circumstances its cultivation is comparatively easy.





GREEN SPLEENWORT, (*half the natural size*).

Characters.

Genus.—ASPLENIUM. (See page 219).

Species.—VIRIDE. Stipes somewhat shorter than the frond, purple at the base, otherwise green: frond very narrow, linear, pinnate: pinnæ stalked, distant, lozenge-shaped, toothed: clusters of capsules linear, at last confluent, rust-coloured.

Synonymes, Figures, &c.

Asplenium Trichomanes ramosum, *Linn. Sp. Pl.* 1541; *With. Bot. Arr. Veg.* 654.

Asplenium viridi, *Huds. Fl. Ang.* 385.

Asplenium viride, *Lightf. Fl. Scot.* 663; *Huds. Fl. Ang.* 453; *Bolt. Fil. Brit.* 24, t. 14; *With. Arr.* 768; *Sm. E. F.* iv. 306, *E. B.* 2257; *Mack. Fl. Hib.* 341; *Franc.* 47; *Newm. N. A.* 28, *F.* 281; *Hook. and Arn.* 573; *Bab.* 414; *Moore,* 165.

There are good figures of this fern in 'English Botany' (tab. 2257), and in Schkuhr, (tab. 73).

We are indebted to our countryman Hudson for first describing this fern with a specific name, in the following passage: — "Asplenium viride frondibus pinnatis: pinnis subrotundis crenatis basi truncatis," (Flor. Ang. ii. 453). It is described by Llwyd as a species in Ray's 'Synopsis,' under the name of Trichomanes ramosum, (Syn. 119); but Linneus, notwithstanding its diagnostics of green rachis and crenated pinnæ are there clearly pointed out, makes it a variety of A. Trichomanes, under the name of Asplenium Trichomanes ramosum, (Sp. Plant. 1541). Hudson's name has been adopted by all subsequent authors: in the first edition of his 'Flora Anglica,' the word is unfortunately spelled viridi, of course a mere typographical error.

Geographical Range.

Asplenium viride is found in all the countries of Europe, but I have not heard of its occurrence beyond the limits of that continent. It is a beautiful little fern, delighting in wild hilly countries, especially if abounding in waterfalls, and shunning the vicinity of man. It is found chiefly in the fissures of rocks; when sheltered growing to a length of eight inches, but when exposed, seldom measuring more than two. My late brother, who, as an invalid, resided at Grasse, in the South of France, wrote to me that it occurred plentifully near that town, growing on hedge-banks exactly as A. Trichomanes does in this country: the specimens were correctly named, and I have received similar information from Professor Duval-Jouve, of Grasse. As the climate is peculiarly mild, and the altitude of Grasse but little above the sea level, this habitat seems at first rather abnormal: but this, as well as other facts connected with its distribution, may perhaps lead to the conclusion that the geographical distribution of this pretty little fern is governed by some geological rather than climatal or altitudinal law.

In the Highlands of Scotland Asplenium viride is a fern of common occurrence. I should not call it an abundant fern, but it is almost impossible to wander among the mountains without frequently noticing it: a few counties are given below.

Argyleshire.—I observed it in several localities.

Dumbartonshire.—Mr. Gourlie has found it on Ben Voirlich.

Lanarkshire.—I observed it growing by the Falls of Clyde; and Dr. Balfour, Mr. Gourlie, and other Scotch botanists, appear to be well acquainted with this station.

Nairnshire.—Mr. Stables informs me that it is of common occurrence in congenial situations in this county.

Perthshire.—Mr. Gourlie and several other botanists have found it on Ben Lawers.

Rosshire.—The Rev. G. Gordon has observed it in this county.

Sutherlandshire.—Mr. Watson has observed it in this county.

The following list of localities, confessedly very imperfect, will show its range in England and Wales.

Northumberland.—Mr. Winch found it sparingly on rocks by the Irthing, at Wardrew.

Cumberland.—Mr. Winch gives Ashness Gill, Borrow Force, and rocks at Gillsland as localities; at the latter station it is very abundant.

Westmoreland.—The Rev. Mr. Pinder has favoured me with specimens from Hutton Roof, Farlton and Arnside. Mr. Hindson informs me it is found on Casterton Fell; and Mr. Watson, on the authority of Mr. Bowman, informs me that it has been found at Mazebeck Scar.

Durham.—Mr. Watson and several other botanists have given me Falcon Clints as a locality.

Yorkshire.—Mr. Tatham, who informs me it is very common on the limestone cliffs above the town of Settle, has kindly supplied me with specimens. It has also been found near Halifax, Ais-la-beck, Richmond, Gordale, Gilla-leys Wood, and other localities too numerous to mention.

Lancashire.—Mr. Sidebotham informs me it grows at Dulesgate, and it is said to have been found in the quarries at Staley, but he has not seen it from the latter locality.

Cheshire.—"Among stones and rubbish thrown out of the quarries at Carr Edge: Mr. Bradbury."—'Botanist's Guide.'

Derbyshire and Staffordshire.—The Rev. Mr. Pinder informs me that it is remarkably abundant and luxuriant in Cavedale, Castleton; and Dr. Wood, that it is abundant near Buxton. I am indebted to Mr. Pinder for a liberal supply of specimens. It also occurs in Dovedale, on both sides of the river, therefore in Derbyshire and Staffordshire.

(Leicestershire.—"A few plants were found in the crevices of the crags on Charley Forest, at Beacon Hill: Pulteney."—'Botanist's Guide.' The Rev. A. Bloxam, to whom I am indebted for a list of Leicestershire ferns, does not mention this species: and as I am informed that Asplenium Trichomanes does grow in the locality indicated, it seems possible that an unintentional mistake has occurred).

(Worcestershire. — On Ham Bridge: first observed there by Mr. Stretch, of Worcester; the station afterwards verified by Mr. Lees (Phytol. i. 46), and Mr. Westcombe, (Id. i. 513). I had long noted Ham Bridge as a locality worthy of a visit on account of its producing this fern, and resolved to make it an object of pilgrimage. In May, 1843, I wended my way from Sapey brook, along the rich valley of the Teme, through meadows clothed with luxuriant herbage, and among cattle fit for a Smithfield show. As I approached the bridge, the red bricks of which it is built, and the dry and dusty road which passed over it, seemed in no degree to increase the chance of success: yet on that bridge, facing the road-way and covered with dust, was the identical plant I sought; small, indeed, but the species not to be mistaken. This station can scarcely be regarded as strictly natural).

Caernarvonshire.—I have found it in abundance near Llyn-y-cwn.

Brecknockshire. — Mr. Ralfs informs me that he has found it near Brecon, on Brecon Beacon, and on Trecastle Beacon: Mr. Westcombe gives me Chapel-y-Fin as a habitat: Mr. Lees observed it at the waterfall of Scwyd-yr-Henryd, near Capel Colbren, on the rocks below the fall, on the right-hand side, where there is also a very old trunk of mountain ash covered with a drapery of this fern.

Glamorganshire.—Mr. Dillwyn and Mr. Edward Young have found it in crevices of the rocks at the upper Cilhepste waterfall, near Pont Nedd Vecchn; and Mr. Dillwyn at Darran yr Ogof, near Ystradgunlais, (Phytol. i. 282). Mr. Babington informs me he found it at Merthyr Tydfil[1].

(Sussex.—Mr. Thomas Moore has recorded the discovery of this fern at Danny, near Brighton: (see Phytol. iv. 842, 915, 946; v. 50). I cannot consider this a natural station).

(Surrey.—"In the deep cracks of an old brick wall at Mickleham, Surrey, where I was shown upwards of twenty plants, by a gardener of that neighbourhood, who discovered it a few months ago, and had taken away several roots."—Mr. Borrer, in Phytol. v. 50).

(Kent. — A locality exactly corresponding with Mr. Borrer's Surrey station appears to have been known as far back as the time of Plukenet: — "Muris saxeis innatum conspexit D. Plukenet in horto D. Owen apud Maidstoniam in Agro Cantiano."—See Raii Syn. p. 119, and Pluk. Alm. p, 9).

In Ireland it appears to be much less common than in Scotland or the North of England,

Cork.—Dr. Taylor has found it near Bandon, in this county.

Donegal.—Mr. W. Thompson informed me it was found by Mr. E. Murphy near Lough Eask.

Kerry.—Dr. Mackay and several other botanists give Turk Mountain, by the Lakes of Killarney, as a locality.

Sligo.—Mr. W. Thompson and several other botanists have found it on Ben Bulben.

Description.

The radicles are fibrous, black, and extremely tender: the caudex is black, scaly, and tufted: the fronds appear in May and June, they arrive at maturity in August, and remain green throughout the winter; they are fertile only. The stipes is half as long as the frond; the basal portion is black or purplish, the remainder, as well as the whole of the rachis, is of a vivid green: the frond is narrow, long, linear, and simply pinnate: the pinnæ are not so numerous as in A. Trichomanes, they are quadrate, but without angles, and are more or less crenate at the margin; they are for the most part placed alternately, and are generally very distinct and distant, but I have seen them crowded, as, for instance, in the plants from Ham Bridge: they are attached to the rachis by their stalks only. The lateral veins are either simple or forked; they bear a long linear cluster of capsules, and, when forked, the cluster is almost invariably situated anterior to the fork: this appears to me a very excellent diagnostic, and one by which this species may readily be known from A. Trichomanes: some of the veins reach the margin of the pinna. The clusters of capsules are at first covered by a long white involucre, which soon disappears, and they become a bright ferruginous confluent mass, occupying the middle of the pinna, and concealing the midvein: the clusters, before their union, are usually six in number.

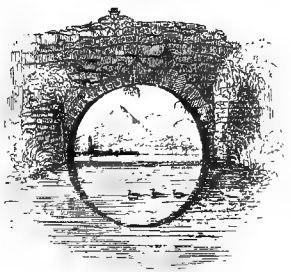
Varieties.

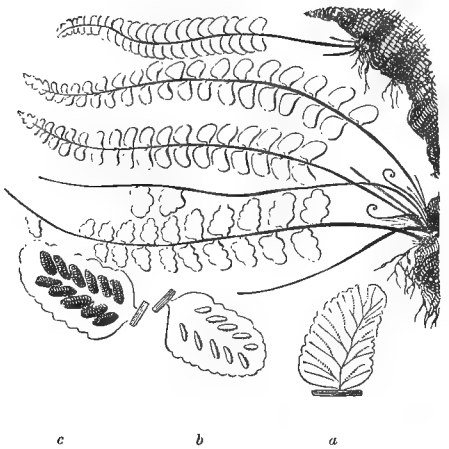
The outline or circumscription of frond varies but little in this fern, but it has an extraordinary tendency to produce bifid or double fronds: the branching sometimes takes place at about half the length of the stipes, as represented in one of the fronds at page 243, sometimes at the junction of the stipes and rachis, and sometimes in the rachis itself, and at any part thereof: in an example in my possession this forking is threefold, or, to use a more technical expression, the frond is thrice dichotomously divided. The character was certainly formerly considered distinctive of the species, as will be seen by a reference

to Ray, &c. I should add, that the late Mr. Samuel Gibson, of Hebden Bridge, obliged me by the sight of specimens which had the pinnæ lanceolate and acute: he proposed to call this form Asplenium viride, *var.* acutifolium.

Culture.

This fern is of easy culture in the open air, provided the soil be light and the atmosphere humid. In a greenhouse it is very uncertain, thriving well for the first or perhaps the second year, but afterwards refusing to renovate its fronds, from some inexplicable cause. A compost, consisting of chips of micaceous rocks, sand, peat, and a slight admixture of thoroughly decayed leaf-mould, seems best adapted to its requirements: it also needs good drainage, and likes to be covered with a bell glass. When successfully grown it is a very pretty plant, but I regret to say that its usual appearance is shabby and ill-conditioned. The next species is readily cultivated on brick walls, amongst stones, or on an ordinary rockery: it prefers a northern aspect.





MAIDENHAIR SPLEENWORT, (*a small plant, natural size*).

Characters.

Genus.—Asplenium. (See page 219).

Species. — Trichomanes. Caudex tufted: stipes generally shorter than the frond, dark purple throughout: frond pinnate: rachis at first green, dark purple when mature: pinnæ distant, ovate, attached by a very short stalk: clusters of capsules linear, dark brown.

Synonymes, Figures, &c.

Asplenium Trichomanes, *Linn. Sp. Pl.* 1540; *Huds. Fl. Ang.* 452; *Bolt. Fil. Brit.* 22, t. 15; *With. Arr.* 768; *Sm. E. F.* iv. 305, *E. B.* 576; *Mack. Fl. Hib.* 341; *Franc.* 46; *Newm. N. A.* 28, *F.* 285, *Phytol. App.* viii.; *Hook. and Arn.* 573; *Bab.* 414; *Moore*, 162.

Asplenium Trichomanoides, *With. Bot. Arr. Veg.* 653; *Lightf. Fl. Scot.* 662.

Asplenium anceps, *Lowe*.

There are good figures of this fern in Gerarde (Em. 1146), Bolton (Fil. tab. 13), 'English Botany' (576), Hooker's 'Flora Londinensis' (156), and in many of the continental Floras.

Concerning the name, little difference of opinion has prevailed. Berkenhout (Syn. ii. 305), and one or two others, have called it Trichomanoides; but nearly all authors have described it as Asplenium Trichomanes. The A. anceps of Lowe, common in the Atlantic islands, in Ireland, and the South and West of England, differs only in size.

Geographical Range.

This beautiful little fern is found in every country of Europe, in Africa, in the Atlantic islands, where it is called Asp. anceps, and in the United States of America, where it has been called Asp. Trichomanoides: but after a careful comparison I am unable to detect any specific difference between the North-American, Atlantic, and British plants.

This species occurs generally throughout England, Wales, Scotland, and Ireland: it grows upon rocks, walls, churches, ruins, bridges, on banks, and in hedge-rows. In the eastern counties it is much less common than in the western: in Essex, Norfolk, and Suffolk it may be considered rare, but it occurs in all these counties. I am indebted to Mr. G. S. Gibson for a specimen from Hadstock church, and to Mr. R. Jacob for another from Bishop's Stortford, both in Essex. At Churt, near Godalming, in Surrey, the large form of this fern clothes the hedge-banks in some places for more than a hundred yards, with scarcely any admixture of other plants. In the West of England, and especially in Wales, it is a common fern. I once saw it in the valley of the Wye, growing in such profusion on a little bridge near the town of Bualt, that it formed a continuous covering of green, and presented a very beautiful appearance. There is scarcely anything in the vegetable world more lovely than such a scene as this; and it is only known by those who have tried the experiment, how readily such a scene may be realized in a garden.

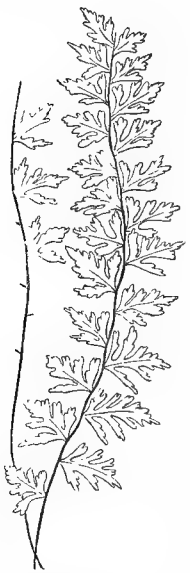
Description.

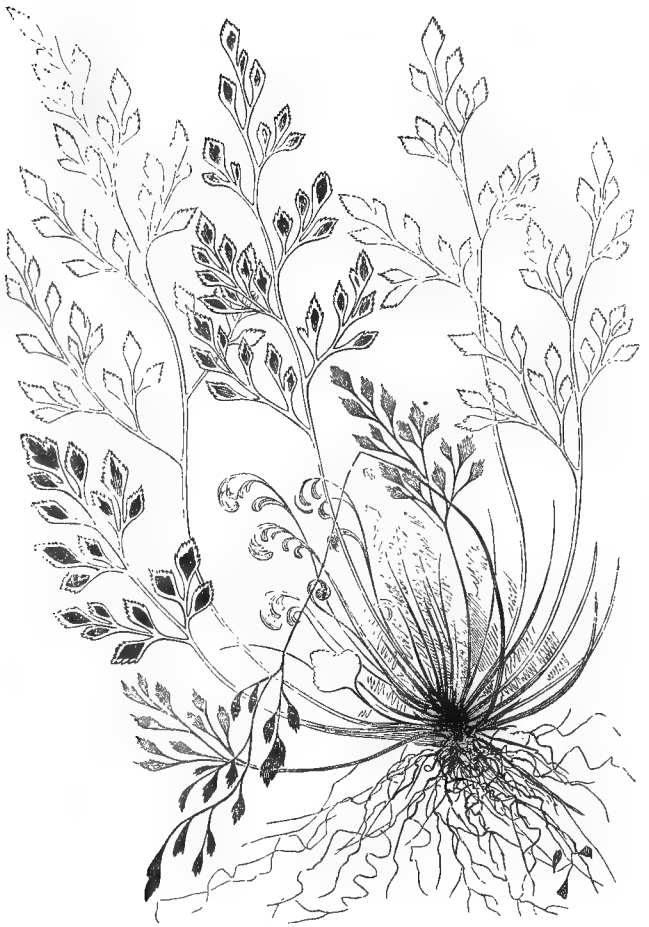
The radicles are black and wiry; they insinuate themselves into the fissures of rocks, previously so small as to escape observation: in old buildings, this fern certainly promotes decay, by disintegrating the mortar, which, however enfeebled by time, still adds in some degree to their strength and durability. The fronds make their appearance in April and May, arrive at maturity in August and September, and remain perfectly green throughout the winter. The stipes is about a third as long as the frond, smooth, shining, and, throughout its whole length, of a purplish black colour. The frond is narrow, linear, and simply pinnate: the rachis is green at first, but becomes dark purple: the pinnæ dark green and very numerous, irregularly ovate, obtuse at the apex, and more or less crenate at the margin; they are usually distinct and distant, but are sometimes crowded and each more or less recumbent upon the one preceding it; they are attached to the rachis by their stalk only, and when the frond approaches decay, the pinnæ fall off like the leaves of phænogamous plants, leaving the rachis naked; and these, together with the stipes, being very durable, remain from year to year, and become a dense tuft of denuded bristles. The pinnules vary from the size of those represented at page 249, to that of the detached ones in the same figure, intended to illustrate the fructification. The lateral veins are forked soon after leaving the midvein (see fig. *a*), the anterior branch bearing a linear cluster of capsules almost immediately after the division; this cluster is at first covered by a long, linear, white, membranous involucre, (see fig. *b*); as the capsules swell this becomes obliterated, and the clusters, which are dark brown, become nearly confluent in two series (see fig. *c*), which, however, very rarely unite over the midrib: the clusters are ten or twelve in number.

Varieties.

This fern is, generally speaking, constant in its form, and rather remarkable for its uniformity of appearance. I have,

however, received a marked variety from the late Mr. Samuel Gibson, of Hebden Bridge. The pinnæ of this variety, instead of being nearly entire, as is usually the case, are deeply pinnatifid, as represented in the figure in the margin, and the pinnules or lobes are irregularly dentate. The specimens sent by Mr. Gibson are perfectly without fructification, but I do not know whether this is to be considered a character of the variety, or incidental only to the fronds I have received. The right-hand figure is a fac-simile representation of one frond as regards form and size; the left-hand figure represents a portion of a frond in which the divisions are still more irregular. This beautiful variety appears to have been known to our earliest botanists, two previous figures existing in their works; neither of them, however, represents the fronds quite so deeply divided as in the present instance. One figure is in Plukenet's 'Phytographia' (tab. 73, fig. 6), the plant being described in that author's 'Almagestum Botanicum' (9) as "Adiantum maritimum, segmentis rotundioribus:" it is stated, on the authority of Sherard, to have been found in Jersey. The second figure is in plate 315 of Tournefort's 'Institutiones Rei Herbariæ;' it is also noticed in Dillenius's edition of Ray's 'Synopsis,' and by Smith, in the 'English Flora,' where it constitutes the variety β. of Asplenium Trichomanes. The variety γ. of Smith, to which that author quotes Sir Robert Sibbald's description, appears to have little resemblance to the variety or even species in question, if I may venture to judge from Sibbald's plate 3, fig. 4, to which Smith refers; but as to the correctness of the reference, I am unable to speak, for Sibbald himself has, in no way that I can discover, connected the text and the figure. Mr. Gibson's plant was gathered at Kant Clough, four miles from Burnley, in Lancashire: it was originally discovered there in 1832, and some plants taken up at that date and planted in a garden at Halifax, have been found to retain their remarkable character in cultivation. A very similar variety has been found in Devonshire by the Rev. W. S. Hore, who has kindly sent me a specimen.





RUE-LEAVED SPLEENWORT, (*natural size*).

Characters.

Genus. — AMESIUM. Ultimate divisions without a distinct midvein: veins of the ultimate divisions very few, sparingly branched, free at the extremities: involucres narrow, linear, frequently facing each other as in the preceding genus, but rarely overlapping.

Species. — Ruta-muraria. Caudex tufted: stipes longer than frond: frond deltoid, composed of a few diamond-shaped, stalked, leaf-like divisions: clusters of capsules linear, becoming confluent and entirely covering the divisions of the frond.

Synonymes, Figures, &c.

Asplenium Ruta-muraria, *Linn. Sp. Pl.* 1541; *Lightf. Fl. Scot.* 665; *Huds. Fl. Ang.* 453; *Bolt. Fil. Brit.* 28, t. 16; *With. Arr.* 769; *Sm. E. F.* iv. 309, *E. B.* 150; *Franc.* 45; *Newm. N. A.* 27, *F.* 261; *Hook. and Arn.* 573; *Bab.* 414; *Moore*, 169, (excl. the lower right-hand figure).

Amesium Ruta-muraria, *Newm. F.* 10, *Phytol. App.* viii.

Of the figures of this fern I cannot speak in high praise. Concerning its nomenclature, no difference of opinion appears to have arisen.

Geographical Range.

It is generally distributed over the continent of Europe, preferring towns and buildings to the open country. I am indebted to Mr. Lea for specimens from the United States.

Throughout the northern, western, and southern counties of England, and also in Wales, Scotland, and Ireland, this fern is to be found on almost every ruin; but, as regards England, far less abundantly in the eastern than in the western counties. In a perfectly wild state, it grows abundantly on the rocky hills in Scotland, particularly on Arthur's Seat, near Edinburgh; in the Peak district of Derbyshire; on Cader Idris, and Snowdon more sparingly. It is one of those plants which, like our half-domesticated birds, the sparrow, the swallow, and the martin, seem to have deserted their native wilds, and to have taken up their residence amongst the habitations of men. It is abundant on ruins and old churches, and has a strong predilection for brick walls, although Sir J. E. Smith makes Ray assert that "it dies whenever it gets upon burnt bricks," (Eng. Flor. iv. 297). The original passage is, "Lateribus coctis immoritur," (Dill. in Raii Syn. 122): Dillenius either used the verb *immo-*

rior as Horace does in "immoritur studiis"—"he is always at his books;" or he may have written *immoratur*,—"it lives" on brick walls, thus pointing out its *favourite* locality. So carefully observant a man as Dillenius must have frequently seen it flourishing in the crumbling mortar filling the interstices of brick buildings: we need wander no further from London than to the wall of Greenwich Park, to see it flourishing abundantly upon bricks; and nothing can be more common than to see it on the brick walls of fruit-gardens, particularly selecting the uppermost line of mortar, which may perhaps be protected by a coping of brick: this is ever a favourite station for cobwebs and wall rue.

Description.

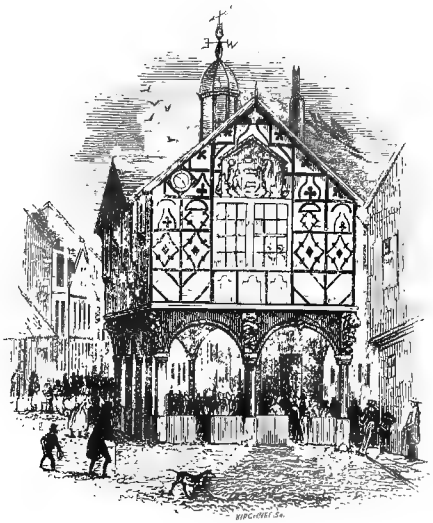
The radicles of Asplenium Ruta-muraria are wiry and black: the caudex is black, tufted, and clothed with bristly scales: the fronds make their appearance in May and June, arrive at maturity in September, and continue perfectly green throughout the winter, and until the ensuing May: they are always fertile. The stipes is black or dark purple, very smooth and shining, and generally longer than the frond. The normal form of the frond is triangular and pinnate; the pinnæ being alternate and also pinnate: the pinnules are of varied form, but mostly somewhat diamond-shaped; they are stalked, and resemble so many little leaves; their exterior margin is generally serrated or crenate. The veins radiate from the stalk to the exterior margin of the pinnule, and to them are attached the elongate lines of capsules, two, three, four, or even five on a pinnule: these are at first covered by an elongate, linear, white involucre, the free margin of which generally faces the median line of the pinnule, and is jagged and uneven; this is soon pushed aside by the swelling capsules, turned back, and finally lost, the back of the pinnule becoming eventually nearly covered by a dense, dark brown mass of seed.

Varieties.

The fronds from which the outlines in the margin were sketched, led me to suppose that Asplenium germanicum was but a form of A. Ruta-muraria. Mr. Wilson tells me that this conclusion was drawn too hastily, and I gladly yield to so high an authority, the more especially as Mr. Wilson's opinion seems in unison with that expressed by nearly all the continental botanists. Truth should be the only object of the naturalist; and when, in diligently seeking it with perfect singleness of purpose, his own judgment proves an insufficient guide, it seems but reasonable that he should avail himself of the assistance kindly offered him by others, whose opportunities of observation have been more extended, and whose ability to arrive at a just conclusion is greater than his own. The pleasure an author may be supposed to feel in making the catalogue of his country's productions as full as possible, has also perhaps some little weight; but I am so fully aware that this propensity becomes dangerous when injudiciously indulged, that I endeavour as much as possible to resist its influence. The question of the exact value of differences has hitherto scarcely obtained sufficiently careful attention; but I doubt not the time will arrive when we shall be better informed on this important branch of inquiry, and therefore more united on that difficult point, the determination of the limits of species.

Culture.

The species constituting the genus Amesium are difficult plants to cultivate: they seem to disapprove of the attentions of the gardener, to loathe his waterings and his syringings, to despise his composts, and utterly to eschew the confinement of a bell glass. Out of doors, the wall rue succeeds best on a garden-wall; in-doors, it must be kept in a well-ventilated greenhouse, and planted in a small pot filled with broken brick and old crumbled mortar: water should be supplied very sparingly. It may be observed that the want of success which ordinarily accompanies the attempt to cultivate these little ferns, is often attributable to injuries inflicted on their radicles and caudices in removing them from their original localities; great care should therefore be taken in conducting this difficult process: if permitted, it is best to remove the bricks one at a time, and to replace them as soon as the ferns are secured.



† WEISS' SPLEENWORT.

Characters.

Genus.—AMESIUM. (See page 253).

Species.—GERMANICUM. Stipes shorter than the frond: frond linear, pinnate: pinnæ alternate, distant, of varied form, ascending, bifid or trifid at the apex: clusters of capsules linear.

Synonymes, Figures, &c.

Asplenium germanicum, *Weiss, Pl. Crypt.* 299; *Willd. Sp. Pl.* v. 330; *Hoffm. Deutschl. Fl.* ii. 13; *Ehrh. Crypt.* 43; *Presl, Tent. Pteridog.* 108; *Newm. F.* 265; *Bab.* 414; ? *Moore*, 169, (excl. the figure).

Asplenium Breynii, *Sw. Syn. Fil.* 85; ? *Retz, Obs. Bot. fasc.* i. 32.

Asplenium alternifolium, *Wulfen, Jacq. Misc.* ii. 51; *With. Arr.* 768; *Sm. E. F.* iv. 309, *E. B.* 2258; *Franc.* 44; *Hook. and Arn.* 573.

Amesium germanicum, *Newm. F.* 10; *Phytol. App.* vii.

There is a beautiful figure of this fern in Jacquin's 'Miscellany' (ii. tab. v. fig. 2, p. 51), accompanied by a description by Wulfen; those in 'English Botany' (t. 2258) and Mr. Francis's 'Analysis' are not so good, and that in Mr. Moore's 'Handbook' appears to me to be drawn from the attenuated form of Amesium Ruta-muraria.

Concerning the name of this fern there appears a variety of opinions. It is the Asplenium germanicum of Weiss, published in his 'Plantæ Cryptogamicæ' (299), in 1770, and adopted by Sprengel, Willdenow, Hoffmann, DeCandolle and Sadler; so that, besides having the claim of priority, this is the current name on the continent of Europe. It is the Asplenium alternifolium of Wulfen, published in Jacquin's 'Miscellany' in 1781, as above cited, and adopted by Roth, Withering, Smith, Hooker, Francis and Babington. I have also been accustomed to regard it as the Asplenium Breynii of Retz (Obs. Bot. fasc. 1, p. 32), published subsequently to 1772, and adopted by Weber and Mohr, and Swartz. This synonyme, however, is not so clearly ascertained as the others, and some able pteridologists of the present day believe that A. Breynii is another plant.

The phalanx of botanists who regard germanicum as a species, must constitute my defence for still retaining it in the list; at the same time I must, in justice to myself, state that my own judgment would lead to a different conclusion. In the first place, I would remark, that if a good series of fronds be arranged with a view to exhibit the tendency of Ruta-muraria to approach germanicum, it will be impossible to point out where one species ends and the other begins: thus the very frond selected by Mr. Moore for illustrating the species, I have no doubt would be called Ruta-muraria by nine botanists out of ten. In the second place, germanicum has always some of the characteristics of a monstrosity; the interspaces of the pinnules are of varied length, the pinnæ also vary in size and figure, insomuch that on the same root, it is quite uncertain whether the lowest pinna be the largest or the smallest, if the largest, the next frond will probably have it smallest, and *vice versâ*: its figure is equally unstable and eccentric. Lastly, in other ferns, even down to the very exceptional cases of Cystopteris Dickieana and Pseudathyrium flexile, both at present confined to one station, we find large and flourishing colonies: now no botanist

has ever recorded the discovery of a colony of germanicum; such a discovery would astonish the most earnest advocate for its specific dignity. These are points that must not be passed lightly over: they cannot be adduced in evidence against any other *received* species.

The opinion of Linneus appears to have been in favour of combining this form with Ruta-muraria: in order to exemplify this, I shall quote an observation by M. Jacquin, which stands in his 'Miscellanea Austriaca,' appended to Wulfen's paper already cited, and which is entitled "Plantæ Rariores Carinthiacæ." Alluding to A. germanicum, there described as A. alternifolium, he writes thus:—"Plantulam hanc jam olim crescentem inveni in Austria, circa Glocknitz, in rupibus calcareis, etiam mixtim cum Acrosticho septentrionali. Cum beatus Linneus, quocum communicaverim, *mordicus sustineret meram esse Rutæ murariæ varietatem*, non ausus fui pro nova specie proponere, et omiseram in stirpium agri Viennensis enumeratione."—Jacquin, Misc. ii. 51.

Those who are familiar with the plant usually called Asplenium Breynii on the continent, must have observed its great similarity to septentrionale, while still retaining the chief characteristics of germanicum; so that a complete chain of forms appears to exists, commencing with the normal Ruta-muraria (see page 253), and passing, by means of such plants as are represented in the figures at page 256, the true germanicum, at page 258, and the Breynii just noticed, to the normal state of A. septentrionale, which seems to produce abnormal fronds, as if purposely to complete the series. If we form such a series, where is the pteridologist who shall fix the point at which Ruta-muraria ends and germanicum begins, or at which Breynii ends and septentrionale begins?

I have much pleasure in citing some remarks in opposition to my view, from the pen of the Rev. T. Bell.

"I am aware some botanists have remarked, that attenuated forms of Asplenium Ruta-muraria approach indefinitely near A. alternifolium. I believe the two species have occasionally been confounded, but I always regarded this as a mistake into which no one could fall who had *perfect* specimens before him, and who was not prepared to substitute the general aspect and habit of the plants for their specific characters. As Mr.

Newman, in his recent publication on ferns, has fallen into this mistake, and conjoined the species, I think it not out of place to communicate to the Botanical Society the following brief observations.

"The first character is taken from the form of the frond, which is correctly stated by Sir Wm. Hooker to be bipinnate in A. Ruta-muraria, and, in alternifolium, pinnate, the lower pinna ternate; the pinnæ in both being alternate. Now, so far from its being the tendency of attenuated or contracted forms of A. Ruta-muraria to approach the pinnate form of alternifolium, the truth of the matter is, that the more attenuated the former is, the more distinctly bipinnate does it become; or, in other words, the nearer A. Ruta-muraria approaches alternifolium in its general aspect and habit, the further and more visibly does it diverge in *this* character.

"The second character is taken from the indusium, with regard to which it is hardly necessary to remark, that while that of alternifolium has a smooth even edge, the edge in all varieties of Ruta-muraria is invariably jagged or uneven, and this is quite visible to the naked eye." — Rev. T. Bell, in Trans. Bot. Soc. Edinb. ii. 119.

Without at all attempting to undervalue these observations, I would just observe that the peculiar form of frond had been previously well described in the Floras of France and Germany, and the supposed distinctive character of the involucre pointed out by Sir W. Hooker, who says, "Involucre entire" (Brit. Flor. 442), and by Mr. Francis, who still more explicitly observes, "Indusium entire on the margin," (Analysis, 45).

Geographical Range.

This fern appears to be nowhere common on the continent, but it has been found here and there on rocks and walls in Sweden, Hungary, Germany, France, and Italy. Beyond the limits of Europe I am unable to trace its range.

It is one of the rarest—perhaps the very rarest—of our British ferns. Although found in Scotland, England, and Wales, six localities only are recorded—three Scotch, two English, and one Welch.

Fifeshire. — Sir W. J. Hooker informs us, on the authority of Dr. A. Dewar, that it occurs three miles from Dunfermline.

Perthshire.—I am indebted to Mr. Williamson, of the Royal Botanic Garden, at Kew, for a specimen found in December, 1843, on Stenton Rocks, near Dunkeld, in this county. The locality has previously been recorded, but the plant was supposed to have been extirpated for many years, when I published the following note from Mr. G. Smyttan, of C. C. College, Cambridge: — "After reading your remarks on Asplenium germanicum, I have thought it might be interesting to you to know that I have a specimen of this very rare plant, gathered on Stenton Rocks so lately as last summer. After two hours' climbing on the bare rocks, in one of the most burning days, I at last found the treasure in a fissure of the barest part of the rock."—Phytol. ii. 975.

Roxburghshire. — It appears to have been first noticed by Mr. Dickson, as recorded in the 'Linnean Transactions' (ii. 290), on "rocks in the South of Scotland." Smith adds, "some sunny rocks about two miles from Kelso, on the Tweed," (Eng. Bot. 2258). I do not observe a British specimen in the Smithian herbarium, although I quite understand Smith as saying he received it from Dickson.

Northumberland. — Mr. G. R. Tate found this fern on Kyloe Crags, in this county, in 1851: the discovery is recorded in the 'Phytologist' for April, 1853. "These crags are chiefly composed of rudely columnar basalt, resembling the trap range of Salisbury Crags. Sandstone comes out from beneath this, and at the western end forms a steep cliff. After botanizing for a short time, I had the good fortune to find the Asplenium germanicum growing sparingly upon the basalt. It is not a fern easily passed by: its pale green fronds at once attracted my attention; and a closer examination readily enabled me to determine its species. The few specimens I observed were remarkably luxuriant, so much so, indeed, that I counted upwards of thirty fronds growing on a single root. There appeared to be no possibility of the plants having been introduced. This Asplenium is most nearly allied to A. Ruta-muraria, from which, and from other species of the genus, it is distinguished by its alternately pinnate frond, narrow, wedge-shaped pinnules, and entire involucre. Some regard Asplenium germanicum as a variety of A. Ruta-muraria; but, as the latter does not occur at Kyloe Crags, or in their vicinity, the supposition is by no means probable. A. septentrionale still exists, in considerable abundance, on the high and exposed portions of the crag, as well as among the débris."—Phytol. iv. 909. This fern is also mentioned by Dr. Johnstone, in his 'Terra Lindisfarnensis,' (p. 249); and a reference is made to Trans. Berw. N. Club, iii. 102.

Cumberland.—The first record of the occurrence of Asplenium germanicum in England, is by Mr. H. E. Smith, in a note addressed to myself, and printed in the 'Phytologist' for January, 1848. "Asplenium germa-

nicum has been noticed in this neighbourhood, and, as far as I am aware, this is the first recorded English locality. It was found in the summer of 1846 by William Greaves and Joseph Flintoft, the latter of whom executed the famous model of the Lake District; it was growing in the cleft of a rock in the wilds of Borrowdale." — Phytol. iii. 11. In September, 1852, Miss Wright rediscovered the fern, I believe in the same station, and obligingly sent me a specimen, accompanied by the following note: — "I take the liberty of inclosing a frond of Asplenium germanicum, which I have found, while looking for A. septentrionale, on high rocks in Borrowdale." —Phytol. iv. 723. Miss Wright's specimen was correctly named; and Mr. Borrer, writing to me under date of November 22, 1853, says: — "Miss Wright showed me a living plant of Asplenium germanicum, and Mr. Flintoft some dried fronds, which they stated to be brought from different spots in Borrowdale. Miss Wright conducted me to the rock whence she 'brought' her plant; but neither on that occasion, nor on previous visits, did she find a second root."

Caernarvonshire. — The discovery of A. germanicum in Wales was first recorded by myself in the 'Phytologist' for October, 1847. "Three years have elapsed since I received an anonymous letter, beginning thus: — 'A lady who has this season visited North Wales,' &c., and then stating that she had found Asplenium septentrionale in great abundance, and also unmistakable specimens of Asplenium germanicum: the locality was carefully and obligingly given, with the view of conducting me to the spot. As far as regards A. septentrionale, I knew the statement to be correct, and had no reason whatever to doubt the more extraordinary fact of A. germanicum having occurred in Wales, other than the feeling of uncertainty whether the nameless lady knew the plant which she so called. The matter is now at rest. I have before me a veritable specimen of Asplenium germanicum, gathered (at the very station pointed out by my anonymous correspondent) by Mr. H. Wilson, and obligingly transmitted for my inspection by Mr. W. Wilson, of Warrington." — E. Newman, in Phytol. ii. 974. Subsequently, Mr. Williams, the Snowdon guide, found a root of this rarity on Moel Lechog, a precipitous rock to the right of the Pass of Llanberis, as you look towards Capel Cerig. This plant was transmitted to the Royal Botanic Garden at Kew, where I saw it some time ago, and where perhaps it is still living.

Description.

The radicles are black and wiry: the caudex is tufted: the stipes dark at the base, but green above: the frond is very

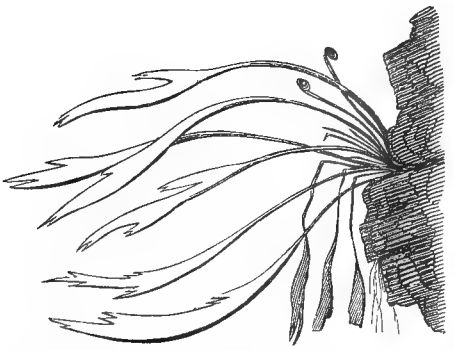
narrow, linear and pinnate: the pinnæ are alternate, amorphous, distant, ascending, somewhat curved, the convexity of the curvature being outwards, the concavity towards the rachis, bifid or trifid at the apex, and occasionally toothed or lobed on one or both sides: the united apical portion of the frond is generally larger and also more pointed than either of the pinnæ, and is also amorphous, being dissimilar in different fronds of the same plant: the pinnæ, as in the last species, are without a midvein; they have two, three, or four sub-parallel, longitudinal veins, and on each of these is usually situated a line of capsules, which, as far as I have observed, is covered by a linear, somewhat inflated and persistent involucre, which is slightly arched over the capsules, opens towards the median line of the pinna, and has a sinuous and sometimes entire free margin.

Varieties.

From the preceding observations it will, I think, be manifest that this little fern is *all* variety, and has no normal form: each plant differs from the rest, and each frond, as developed, is also found to differ from the preceding one. It would therefore be useless to attempt any definition of varieties.

Culture.

This little fern is common in cultivation, but, generally speaking, is not long-lived. It is cultivated with more success on the continent, especially in Germany and the South of France, where it is sought for with avidity, owing to its high money-value, and is freely imported by our nurserymen. My friend, Mr. Birkett, has a British specimen growing luxuriantly in a Wardian case at the top of his house in Wellington Street, Southwark. It should be planted between fragments of free-stone, in a soil composed of peat and thoroughly decayed vegetable mould, the latter in small quantities. Great care should be taken that water be supplied moderately, and none should be allowed to stagnate about the roots.



FORKED SPLEENWORT, (*natural size*).

Characters.

Genus.—Amesium. (See page 253).

Species. — Septentrionale. Stipes and frond of equal length, their separation indistinct: frond linear, narrow, gradually diminishing into the stipes, sometimes forked; apices of divisions bifid: clusters of capsules in two, three, or four long linear series.

Synonymes, Figures, &c.

Achrostichum septentrionale, *Linn. Sp. Pl.* 1524; *Lightf. Fl. Scot.* 656; *Huds. Fl. Ang.* 450; *Bolt. Fil. Brit.* 12, t. 8; *With. Arr.* 764.

Asplenium septentrionale, *Sm. E. F.* iv. 308, *E. B.* 1017; *Franc.* 44; *Newm. N. A.* 27, *F.* 269; *Hook. and Arn.* 572; *Bab.* 41; *Moore*, 170.

Amesium septentrionale, *Newm. F.* 10; *Phytol. App.* vii.

The figures of a fern so very marked are of necessity characteristic: I scarcely know one by which the species may not instantly be known.

The specific name of septentrionale appears to have obtained the concurrence of all botanists, but the genus has been a

matter of difficulty and doubt. We find our earliest authors properly referring this plant to the ferns. Ray calls it "Filix saxatilis Tragi" (Syn. 120), and Linneus (Sp. Plant. 1524), followed by Hudson, Bolton, Berkenhout, Withering, and several others, denominates it Acrostichum septentrionale, but Withering observes, that when young it is an Asplenium. Roth removes this species, together with Amesium germanicum and A. Ruta-muraria, to the genus Scolopendrium, which also includes Phyllitis Scolopendrium and Notolepeum Ceterach of the present work. Ruta-muraria, germanicum and septentrionale form a group very distinct from the other British species of Asplenium, inasmuch as their pinnules want the midvein, which is always present in the rest.

Geographical Range.

Amesium septentrionale occurs most abundantly in Hungary, some parts of Germany, and the South of France: it is also recorded as an inhabitant of Lapland, Sweden, Denmark, Russia (both Asiatic and European), Spain, and Italy. In the North, it seems very rare; in the South, much more common. I believe it has not yet been observed in America.

This is one of the rarest of our British ferns: it occurs only in the fissures of rocks, and the interstices of stone walls; in the latter situation it appears to thrive more luxuriantly, probably from the frequently exposed position and elevation of the former. I think I have seen specimens from nearly all the recorded stations, and none of them are equal in luxuriance to those which I found by the farm-yard at Llanrwst, which, being on the Conway, and not far from its mouth, is but slightly elevated above the level of the sea. At Llanrwst, the tufts of this fern were very large; one of them was so heavy, that after shaking out all the loose earth, I found it a very inconvenient load to carry for even the single mile I had to convey it: this tuft, consisting I suppose of a single caudex, had upwards of three hundred perfectly vigorous fronds, besides at least an equal number of decaying ones, the relics of previous years.

In occurs in twelve counties, — four Scotch, six English, and two Welch. I have no record of its occurrence in Ireland.

Forfarshire.—Mr. G. Don, (Cyb. Brit. iii. 283).

Edinburghshire. — Ray (Syn. 120) records that it was observed by Thomas Willisell on the rocks in Edinburgh Park. This is certainly identical with Arthur's Seat, a locality often recorded, and one in which the plant still exists. Smith says it was also abundant at the Hermitage, by Blackford Burn, near Edinburgh, in 1782. I am indebted to Dr. Greville, Dr. Balfour, and Mr. Ray of Epping, for specimens from the vicinity of Edinburgh.

Roxburghshire.—Rev. James Duncan, (Cyb. Brit. iii. 283).

Perthshire.—I am indebted to Mr. Williamson, of the Royal Botanic Garden, Kew, for specimens gathered by Mr. Henderson at Stenton Rock, near Dunkeld, in this county.

Northumberland.—Dr. Johnstone says it occurs in the fissures of the columnar cliffs of Kyloe Crags, where it was first noticed by the Rev. J. Baird; it is also given by the same author as from Minto Crags, in the same county. Both these localities were previously recorded; and I could have wished that the learned author had verified them. It will, however, be seen by a reference to the 'Phytologist,' that Mr. Tate saw the plant at Kyloe in 1851; he says: — "A. septentrionale still exists on the high and exposed portions of the crag, as well as among the débris." — Phytol. iv. 909. Mr. Watson also gives Northumberland or North Durham, on the authority of Mr. E. C. Atkinson and Mr. John Storey, (Cyb. Brit. iii. 283).

Cumberland. — Mr. Heysham informs me that in 1837 and 1838 he found this fern on Honister Crags, and on crags in the vicinity of Scaw Fell. Hutchinson gives Patterdale and Keswick as localities. Turner and Dillwyn, on the authority of Mr. Wood, say it has been found in a ravine of the Screes, near Wastwater, about 600 feet in perpendicular height; and Miss Wright informs me that it occurs on rocks in Borrowdale.

Westmoreland. — Hudson records that it has been found on mountains above Ambleside, in this county.

Yorkshire.—Hudson records that it has been found by Mr. Tofield on Ingleborough; but those able and most industrious botanists, Mr. Backhouse and Mr. Tatham, both inform me they have sought Ingleborough in vain for this fern: they have particularly examined the grauwacke and porphyritic rocks at the foot of the hill, and also the millstone grit at the summit.

Somersetshire and Devonshire. — Mr. N. Ward found it plentifully on loose stone walls in the parish of Culbone, about six miles from the boundary of the county, and at an elevation of about 1000 feet above the sea: he has kindly contributed a liberal supply of specimens from this locality to my collection. It has also been found in profusion by the Rev. W. S. Hore, on a loose stone wall, two miles north of the parish church of Oare: perhaps this is identical with the locality discovered by Mr. Ward;

and since the publication of these localities, Potter, a well-known collector of British ferns, visited the district, and brought home hundreds, or perhaps thousands of roots for sale: I saw more than a bushel of them in his possession. From his description, I am led to believe the fern common on the stone walls of the neighbourhood, and not confined to either county.

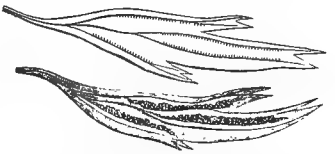
Caernarvonshire. — Ray records that this fern was found by Mr. Llwyd on the summit of Carnedd Llewelyn, (Syn. 120). Mr. Wilson has found it near Llyn-y-cwn; and Mr. Babington on rocks near the Pass of Llanberis. Mr. Wm. Williams (the Snowdon guide), and many others, have found it in the Snowdon district, particularly on Moel Lechog, also on rocks about Bettwys-y-Coed, on the Caernarvonshire side of the river, and in several spots near Pont-y-Pair. I had the good fortune to discover it in profusion on a loose stone wall, about a mile from Llanrwst, on the Conway road; the locality is on the left hand, looking towards Conway, and exactly opposite a small farm-yard, certainly on the Caernarvonshire side of the river. Several botanists have visited the place subsequently, and taken it away in such quantities as nearly to destroy the habitat, so nearly, indeed, that others have been unable to discover a trace of its former existence. I deeply regret the prevalence of this exterminating spirit, for it tends to deprive the true botanist of one of his greatest pleasures,— that of visiting rare plants in their native localities. It however affords me some satisfaction to know that the plant has since been observed by Mr. Wilson on the same wall, two hundred yards nearer Conway; and that it grows in many other spots in the neighbourhood, especially on rocks above this station, and extending towards Capel Cerig.

Denbighshire.—It is recorded by Ray that Dr. Richardson found it on old walls at Llan Dethyla, about a mile from Llanrwst, towards the North, (Syn. 120). Turner and Dillwyn place this habitat in Denbighshire: the possibility of its being in Caernarvonshire, and identical with the one I have recorded as discovered by myself, has often occurred to me; but when in the neighbourhood I failed to find Llan Dethyla, probably through my inability to pronounce the name intelligibly.

Description.

The radicles are very long, fibrous, crooked, and intertwined, and, together with the caudex, which is very large and tufted, form an amazing bulk. The fronds make their appearance in March and April, arrive at maturity in August, and remain green throughout the winter: they grow in a horizontal position, from a perpendicular surface; the fronds represented at

page 265, are in their natural position: the form of the frond is elongate, lanceolate, and furnished laterally with one or two short bifid teeth or serratures, and the apex also terminates in a bifid point; it diminishes imperceptibly towards the base, and there terminates in a smooth stipes, which is black at the extreme base. The veins are nearly simple, and few in number, one running into each serrature: the capsules are attached to each vein in a continuous line, covered at first by an involucre of similar shape, which opens towards the middle of the frond, and, as the capsules swell, is thrown back, and finally lost, and the lower surface of the frond then presents a continuous mass of capsules. Roth describes the involucre as double (Flor. Germ. iii. 50); but this, although certainly the case as regards the apical portion of the frond, is not so with the basal portion. The free margin of the involucre is sinuous, but not jagged.



This fern in its normal state is so very different from every other British species, that there is not the slightest danger of any confusion occurring in this way. On the other hand, its similarity to the buck's-horn plantain (*Plantago Coronopus*) is so great, that a superficial observer might well be excused for mistaking it for that plant. Although occasionally established in lofty and exposed situations, it can scarcely be considered a hardy species, since it is very susceptible of cold, its young fronds being injured by a very slight frost, as noticed by Mr. Watson.

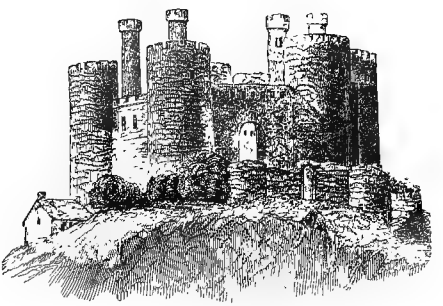
Varieties.

The observations on Asplenium Breynii at page 260, apply with equal force here. When Amesium septentrionale in cultivation happens to be neglected, and deprived of moisture, especially towards the end of autumn, new fronds are developed, in which the rachis becomes more distinct, the divisions of the frond assume the character and appearance of pinnæ, and their apices become blunter, without losing in any degree their bifid or trifid character: the free margin of the involucre always

remains entire, and it is therefore probable that a frond of this kind was before the Rev. Mr. Bell, when he penned his interesting paper for the 'Transactions of the Botanical Society of Edinburgh' (ii. 119), reprinted at page 261 of this work. It will be observed that Mr. Bell's avowed object is to establish his fern as a species distinct from A. Ruta-muraria.

Culture.

Strictly evergreen, and very singular in appearance, this fern is well worth the trouble of cultivation. Mr. Wollaston says that it "not only requires very careful potting, but extreme care and attention afterwards;" a remark which I find very true. The plan recommended for Ruta-muraria may be followed also with this species, always however bearing in mind that the loss of plants is much more difficult to repair. I prepare a number of thin pieces of freestone, and having placed them in an ordinary flower-pot in an erect position, introduce the radicles of the fern between two of them, allowing the crown of the caudex to stand clear above them: the pieces of stone should then be wedged up firmly by introducing others at their sides, and a little sifted peat earth and old mortar should be shaken into the crevices. Water must be used very sparingly.



HART'S-TONGUE SPLEENWORT, (*one-eighth the natural size*).

Characters.

Genus.—PHYLLITIS. Lateral veins twice or thrice bifurcate, free at the extremity: capsules in linear series upon the anterior and posterior branches; on the anterior directed towards the apex of the frond, on the posterior towards its base, always in pairs, that is, when the anterior branch of a lateral vein bears a line of capsules, the posterior branch of the lateral vein next

before it also bears a line of capsules corresponding in length, and the two lines or series form a confluent mass of capsules, covered by two involucres, which face each other, and, in an early stage of growth, overlap and *appear* united.

Species. — SCOLOPENDRIUM. Stipes shorter than the frond: frond strap-shaped, entire, cordate at the base.

Synonymes, Figures, &c.

Asplenium Scolopendrium, *Linn. Sp. Plant.* 1537; *Lightf. Fl. Scot.* 660; *Huds. Fl. Ang.* 452; *Bolt. Fil. Brit.* 18, t. 11; *With. Arr.* 766.

Scolopendrium vulgare (*Sym. Syn.*), *Sm. E. F.* iv. 314, *E. B.* 1150; *Mack. Fl. Hib.* 342; *Franc.* 52; *Newm. N. A.* 28, *F.* 289; *Hook. and Arn.* 574; *Bab.* 415; *Moore*, 173.

Phyllitis Scolopendrium, *Newm. F.* 10, *Phytol. App.* vi.

It is almost impossible to fail in giving an intelligible representation of so marked a species: all the British and continental figures sufficiently exhibit its very distinctive form.

This fern is the Phyllitis of Ray (Syn. 116), and all the older authors. Linneus made it an Asplenium (Sp. Plant. 1537), giving it the specific name of Scolopendrium, in which he was followed by Hudson (Fl. Ang. ii. 452), Berkenhout (Syn. ii. 305), Withering (Arr. Brit. Pl. iii. 766), and Hoffmann (Deuts. Flor. ii. 13). Sir J. E. Smith, in the 'Turin Transactions' (Acta Taur. v. 410), separated it from Asplenium as a new genus, to which he gave the name of Scolopendrium: in this genus he included Ceterach. The present plant was described by Symons (Syn. 193) as Scolopendrium vulgare, a name adopted by Smith, Hooker, Francis, and Babington. On the continent, Swartz (Syn. Fil. 89) adopted Smith's genus, but gave the species the name of officinarum: in this he was followed by Willdenow, and Weber and Mohr. It is the Scolopendrium Phyllitis of Roth (Fl. Germ. iii. 47), and the Scolopendrium officinale of the 'Flore Française' (ii. 552). It appears to me that the present species, together with the Portuguese Hemionitis, a species announced and admirably figured as British in Gerarde's 'Herbal' (Ger. Em. 1138, figs. 3, 4, 5), but which has eluded the vigilant eyes of all subsequent botanists, constitute a

natural division of the great Linnean group Asplenium, which still requires a generic appellation: in this case the original and well-known term Phyllitis may with much propriety be employed.

Geographical Range.

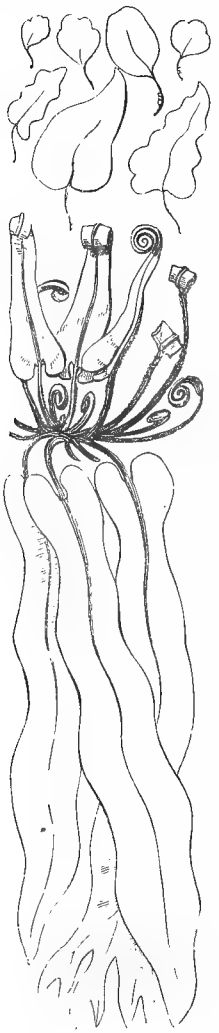
I believe this handsome species is found in every country throughout Europe, but is very sparingly distributed towards the North. It is said to have been found in the United States, but is there considered one of the rarest of ferns. I know nothing of it in Africa, Asia, or South America.

The hart's tongue is a particularly handsome and ornamental fern: its habit is well marked, and very decidedly different from that of every other British species. I believe it is universally, although not abundantly distributed: it so frequently grows in the thickest part of hedges that it may readily escape observation, and thus does not appear so abundant as it really is. In Scotland I found it sparingly distributed, but I never passed a day without recognizing it in some few localities. In Ireland it is much more abundant: it is not only scattered generally over the island, but occurs in some localities in very great abundance, particularly in the neighbourhood of Sligo, and in the demesne of Muckruss, near Killarney; here it grows among the underwood, in the shrubberies, &c., in large luxuriant tufts, the fronds radiating from a common centre, and each being gracefully arched in a semicircle, like the long feathers of a cock's tail, (see page 276). The hart's tongue is very commonly found upon walls and ruins; and it seems particularly to delight in old wells, in which last situation its fronds sometimes grow to a very large size.

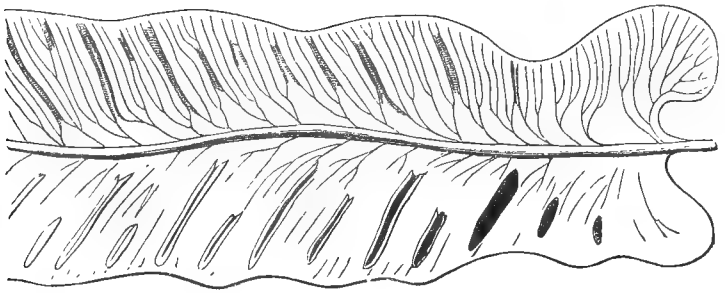
Description.

The radicles are black, stout, and very long and strong: the caudex is tufted, blackish, scaly, and almost spherical: the young fronds make their appearance in April, growing in an erect position, the apex remaining circinate; by degrees they

become horizontal, and at last pendulous; they arrive at maturity by the end of September, and continue in full vigour throughout the winter, and until those of the ensuing year make their appearance. The form of the frond is elongate, linear, and quite undivided, acute at the apex and cordate at the base: the stipes varies from a fifth to a third of the entire length of the frond; it is of a dark purple colour, and rather scaly at the base: in some specimens, but these are generally young, the entire plant is hirsute, in others perfectly glabrous. The seedling plants put on a variety of forms; a few of them are shown in the margin. The veins proceed directly from the rachis, and each has four or five branches: to the outside branches of each vein, or system of veins, is attached a long line of capsules, covered by a white membranous involucre of the same form: owing to this disposition of the capsules on the outer branch of each system of veins, the masses are invariably in pairs; the two involucres at first meet, and appear as one; a day or two later a line appears between them, showing that they are divided; the line gradually becomes more apparent as the capsules increase in size; at last, the two involucres are pushed back from each other, and finally disappear. The veins and attachment of the capsules are shown on the *upper* side of the figure at page 275; the involucres and clusters of capsules on the *lower* side: the earliest stage of the double line and its involucre is shown to the left hand, and each successive figure towards the right shows a gradual advance to maturity. I have taken great pains to make myself understood as to the distinctive character of this genus, not merely for the sake of my own work, but because it appears



to have been misunderstood by previous writers. I would observe that the genus Phyllitis is not in any respect synonymous



with the genus Scolopendrium, as constituted by its author, who purposely so moulded it that the species Scolopendrium and Ceterach might both be included, a union which appears to me particularly unnatural.

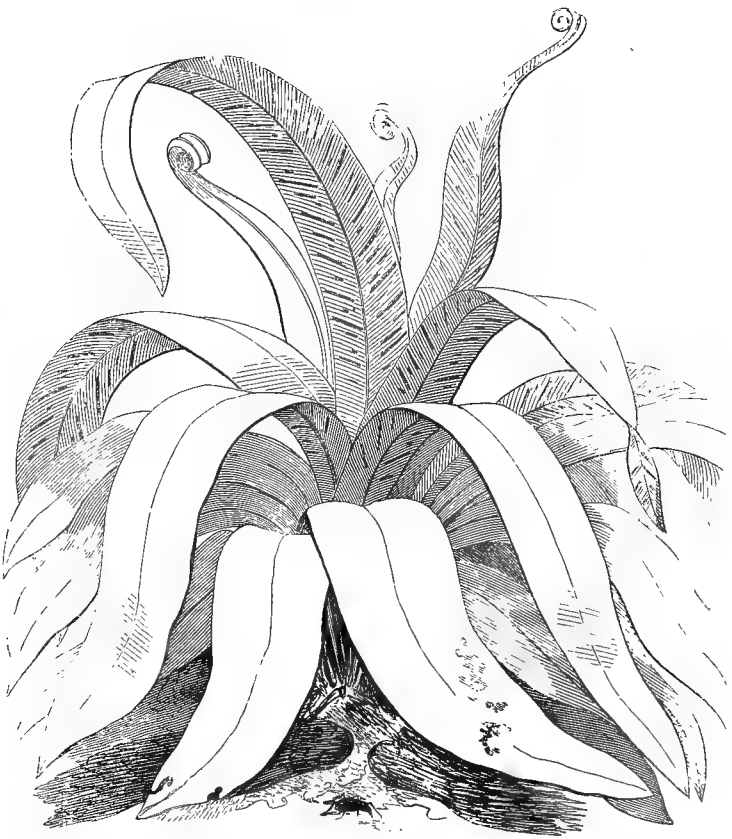
Culture.

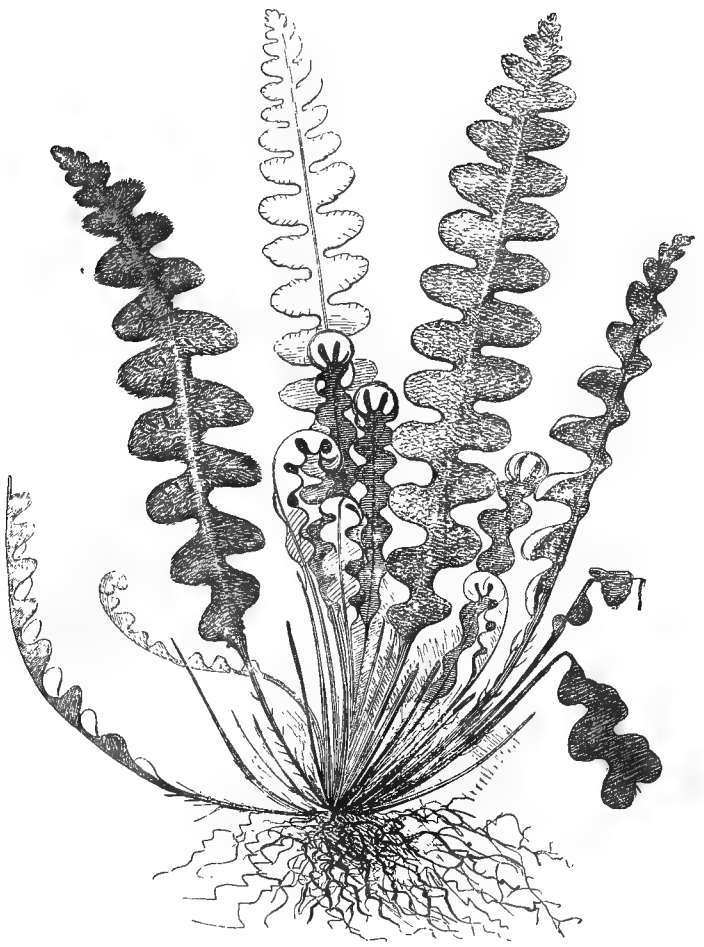
The requirements of this fern are a free soil, shade, and moisture: it is very ornamental on a shaded rockery.

Economical Uses.

We learn from the herbalists that this plant was formerly much in vogue as a medicine. Ray speaks of it favourably as an astringent, and of its healing powers, when applied as an ointment to wounds and ulcers, (Syn. 117). Lightfoot says it is used by the country people in Scotland, as a vulnerary for burns and scalds (Fl. Scot. 661); and we learn from the 'Flore Française,' that it is used in France as an astringent in cases of diarrhœa and hæmorrhage, (Fl. Fr. ii. 555). The late Lady Greenly, of Titley Court, Herefordshire, as appears by a paper from the pen of Mr. E. Lees, in the 'Phytologist' (Phytol. i. 521), took great pains to introduce and cultivate an evergreen fern, called Dail llosg y Tân, as a remedy for burns; and Mr.

Beynon having, in consequence of this paper, with some trouble ascertained the species, received, through Lady Hall, of Llanover, accredited specimens thereof, and found them to be the common hart's tongue. The reader is particularly referred to the first volume of the 'Phytologist' for interesting information on this subject. (See Phytol. i. 521, 582, 589).





SCALY SPLEENWORT, (*natural size*).

Characters.

Genus.—NOTOLEPEUM. Midvein of pinnules present; lateral veins alternate, branched, branches anastomosing among themselves and with the branches of the next lateral vein : clusters

of capsules on the first anterior branch of each lateral vein, and all of them directed towards the apex of the pinnule, except in the first lateral veins, both branches of which bear clusters, the anterior cluster directed as usual, but the posterior towards the midrib of the frond, these are therefore placed back to back: each cluster is accompanied by a narrow erect involucre: the back of the frond is densely clothed with pointed overlapping scales.

Species.—CETERACH. Stipes shorter than the frond: frond linear-lanceolate, pinnatifid; the divisions waved or lobed.

Synonymes, Figures, &c.

Asplenium Ceterach, *Linn. Sp. Pl.* 1538; *Lightf. Fl. Scot.* 661; *Huds. Fl. Ang.* 452; *Bolt. Fil. Brit.* 20, t. 12; *With. Arr.* 767.

Scolopendrium Ceterach, *Sym. Syn.* 193; *Sm. E. F.* iv. 315, *E. B.* 1244.

Grammitis Ceterach, *Swartz, Syn. Fil.* 23; *Mack. Fl. Hib.* 337.

Gymnogramma Ceterach, *Sprengel, Syst. Veg.* iv. 38; *Link, Hort. Berol.* ii. 54; *Ledeb. Flor. Ross.* xiv. 507.

Ceterach officinarum, *Willd. Sp. Plant.* v. 136; *Franc.* 20; *Newm. N. A.* 28, *F.* 293; *Hook. and Arn.* 566; *Bab.* 415; *Moore*, 181.

Notolepeum Ceterach, *Newm. F.* 9, *Phytol. App.* v.

Very intelligible figures of this fern are given in Schkuhr (Fil. tab. 7), in 'English Botany' (1244), and Gerarde's 'Herbal,' (Ger. Em. 1140); those in Bolton (Fil. tab. 7), and many other works, would not be recognized.

This fern is the Ceterach, spleenwort, or miltwast of Gerarde (Em. 1141), the Ceterach officinarum of Bauhin's 'Pinax' (354), and the Asplenium sive Ceterach of Ray (Syn. 118), and others. Linneus (Sp. Plant. 1537) made it an Asplenium, and subsequent authors have differed much as to its nomenclature: Smith making it a Scolopendrium; Swartz, a Grammitis; and Sprengel a Gymnogramma: each name being adopted by many subsequent writers.

Geographical Range.

The scaly spleenwort is found in all the middle and southern countries of Europe, but I believe it has not yet been observed in Lapland, Norway, Sweden, or the North of Russia, but it occurs in the South of Russia, both European and Asiatic: it is common in the North of Africa, and in the Canary and Cape de Verde Islands. In Madeira and Teneriffe there is a plant of much larger size than ours, and of more beautiful appearance: I cannot take upon myself to say whether the two forms are identical as species.

It is very generally scattered over the northern, western, and southern counties of England and Wales: in the midland counties it is of rare occurrence, and in the eastern scarcely known. In a few instances, more particularly in limestone districts, it is found growing freely on rocks, and in what may be considered truly natural situations; but its usual *nidus* is the mortar of ruins, churches, and walls, erected by man, and therefore not strictly natural: for when we provide a proper dwelling-place for plants or animals, whether intentionally or unintentionally, it always partakes more or less of an artificial character. A singular and quite abnormal *nidus* for this fern is recorded by Mr. W. R. Smith in the 'Phytologist:' this gentleman found it growing in company with other ferns, on an old tree overhanging a deep chalk lane at Pitt, near Winchester: (see Phytol. iv. 276). The English counties in which Ceterach is most abundant are Westmoreland, Gloucester, and Somerset. The list of localities which I have received through the kindness of correspondents, exceeds the space that I could afford them, extending to more than ten pages: I have therefore concluded to reserve them for use on a future occasion.

In Scotland, this is a fern of great rarity. Mr. Gourlie informs me that it has been found sparingly at Kilfinnan, in Argyleshire; that gentleman has himself found it on Kinnoul Hill, in Perthshire, a locality previously recorded by Lightfoot in his 'Flora Scotica;' and Mr. Gourlie also states that Dr. A. K. Young has observed it near Paisley, in Renfrewshire. My kind correspondent, Mr. W. G. Johnstone, informs me there are three stations for this fern in Dumfriesshire.

Description.

The radicles of the scaly spleenwort are short, but possess a remarkable power of penetrating mortar, however hard it may be; they also find their way into rocks which appear to present the most compact surface. Still, from the luxuriance of some plants sent me by Mr. Thwaites, it would appear that this species thrives much more vigorously in the rich vegetable mould which has been accumulating during centuries in the deeper fissures: here the radicles are longer, but still appear short as compared with those of other rock-loving species. The caudex is tufted, brown and scaly. The young fronds make their appearance in May, and before unfolding are nearly white: they arrive at maturity in autumn, and continue green and vigorous throughout the winter: they are always fertile. The stipes is short, and beset more or less thickly with pointed scales: the form of the frond is linear, slightly attenuated below, and deeply pinnatifid; the segments are short, rounded, and sometimes crenate or lobed; their position as regards the stipes is rather oblique; their entire under surface is densely clothed with brown, pointed, imbricated scales, which, when examined under the microscope, are found to be very beautifully reticulated. While the frond retains its circinate or undeveloped form, these scales are nearly white. The midvein of each pinna is waved but distinct; the lateral veins are few in number, alternate, and irregularly branched; the branches occasionally anastomose before their termination, as represented by the figure in the margin: the anterior branch of each bears an elongate cluster of capsules; these are situated about midway between the midrib and the margin of the pinna; the points of their attachment are indicated in the figure: the first anterior lateral vein usually bears two clusters of capsules, one on each of its principal branches: the capsules are attached to that side of the vein which is nearest the median line of the pinnæ, and not

on the back of the vein; it should, however, be observed, that the capsules seated on the vein nearest the rachis of the frond are placed in a position opposite to that of the rest, and, in this instance, the dehiscence of the involucre may be said to take place towards the rachis. Immediately adjoining the insertion of the capsules, and attached to the back of the vein, is an erect, white, very narrow, membranous involucre, exactly corresponding in length with the line of capsules with which it is connected.

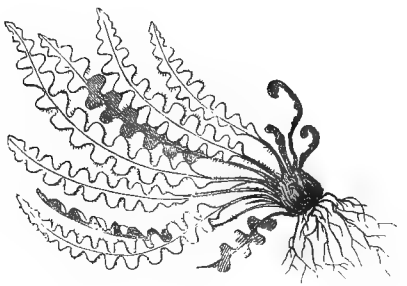
Culture.

This is a ticklish fern to cultivate, and succeeds best when planted in the interstices of a mortared wall, after the mortar has begun to crumble, but this only in a tolerably pure atmosphere; near London it soon dies. In pot culture, much trouble is necessary; the soil should be prepared with great care, using one-third of old crumbled mortar, one-third of peat earth and one-third of limestone or oolite broken very small: it should have but little water, and this little should never be allowed to stagnate about the roots: neither should any water be suffered to remain upon the fronds; for although in a state of nature the plant appears to receive much nutriment through them, since its radicles are scarcely accessible to the influence of rain water, yet, in the still, water-laden atmosphere of a greenhouse the case is different, the atmosphere itself conveying a supply that is abundantly sufficient, and water from extraneous sources being apt to remain on the fronds until it causes decay. Although this fern will bear full exposure to the South, it attains greater luxuriance in a northern aspect, or when protected by artificial means from the rays of the sun.

Economical Uses.

The medicinal properties of Ceterach were formerly supposed to be of great value, but, like those of its congeners, they have greatly fallen into disrepute. It was at one time thought very efficacious applied externally to wounds and ulcers. It has,

moreover, other *virtues*, as they were called, in addition to its medicinal ones: some of these are enumerated by Gerarde, but they appear so very like *vices*, that I decline transferring them to these pages. Gerarde himself, after dwelling on one of them with great apparent zest, adds: — "But this is to be reckoned among the old wives' fables, and that also which Dioscorides tells of, touching the gathering of spleenwort in the night, and other most vain things which are found here and there scattered in old books: from which most of the later writers do not abstaine, who many times fill up their pages with lies and frivolous toyes, and by so doing do not a little deceive yong students."—Ger. Em. 1141. Vitruvius makes a curious assertion respecting this fern: he relates that in Crete there is a river which runs between the cities of Gnosus and Cortyna; and that on the side of Cortyna, where Ceterach grows in great abundance, the swine are found to have no spleen; but on the side of Gnosus, where there is no Ceterach, the pigs rejoice in spleens. Hence the name of spleenwort, or Asplenon, given to this plant, from the Greek α, privative, and σπλην, the spleen.



BRISTLE FERN, (*half the natural size*).

Characters.

Genus. — TRICHOMANES. All the veins prominent, wiry; midvein distinct; lateral veins branched; the anterior branch is continued through the margin of the leaf, and on its naked projecting portion are seated the capsules, inclosed in an urn-shaped involucre: caudex a creeping hairy rhizome.

Species. — RADICANS. Stipes about as long as the frond: frond pendulous, deltoid, twice or thrice pinnate.

Synonymes, Figures, &c.

? Trichomanes radicans, *Swartz, Fl. Ind. Occ.* 1736, *Syn. Fil.* 143.

Trichomanes radicans, *Newm. in litt.* 1838; *Hook. and Arn.* 576; *Bab.* 416; *Moore*, 199.

Trichomanes speciosum, *Willd. Sp. Plant.* v. 514; *Newm. N. A.* 29, *F.* 305, *Phytol. App.* xxix.

Hymenophyllum alatum, *Sm. E. B.* 1417.

Trichomanes brevisetum, *R. Br. in Ait. Hort. Kew.* v. 529; *Sm. E. F.* iv. 324; *Mack. Fl. Hib.* 314; *Franc.* 62.

Trichomanes europæum, *Sm. in Rees' Encyc.* xxxvi.

Trichomanes alatum, *Hook. Fl. Lond.* t. 53.

There is a good figure of this fern in Hooker's 'Flora Londinensis (t. 53), under the name of Trichomanes alatum; and another in 'English Botany' (1417), under that of Hymenophyllum alatum.

This plant is supposed to be the "Filix humilis repens" of Ray's 'Synopsis,' (Raii Syn. p. 128, tab. iii. f. 3), and there stated to have been found by Dr. Richardson near Bingley, in Yorkshire. Passing over the synonymes of Hudson, Bolton, Withering, and Berkenhout, which, although usually supposed to be intended for the present plant, must be received with doubt, we come to the description by Brown in the 'Hortus Kewensis' (Hort. Kew. v. 529, 2nd ed.), who considered the species new, and gave it the name of Trichomanes brevisetum, which has been adopted by most modern botanists. Smith, in Rees' 'Cyclopædia' (Art. Trichomanes), described it as Trichomanes europæum; and Sprengel, in his 'Systema Vegetabilium' (Syst. Veg. iv. 130), as Trichomanes hibernicum. In preparing the first edition of this work for the press, I identified the Irish Trichomanes with the well-known and widely-distributed Trichomanes speciosum of Willdenow, an inhabitant of Madeira, Teneriffe, &c., some beautiful specimens of which had been recently brought to England by my late lamented friend, William Christy. I was not, however, wholly satisfied with the discovery, important though it were; but having at that period a disposition to associate allied species, I carefully compared the T. speciosum of Willdenow with the T. radicans

of Swartz, and finding Swartz's description sufficiently well agree with my plant, suggested the adoption of the earlier name. I was, however, deterred from publishing this view by an examination of fronds labelled T. radicans, but without any locality attached, which were said to be authentic, and which being narrow, strap-shaped, sparingly divided, and perfectly sessile, certainly could not be specifically associated with the Irish plant. Long subsequently, Sir William Hooker entered on the same investigation, and seems to have been quite unaware of what had previously been done, and of the fact that every botanist in the United Kingdom, excepting himself, had accepted my view of uniting the Irish with the Madeira plant, and of adopting the earlier name of speciosum for both. Guided therefore by the results of a perfectly independent research, and assisted by the possession of a matchless series of specimens, Sir William arrived at the conclusion that our British fern was identical, not only with the speciosum of Madeira, but with the radicans of Jamaica. This decision, like my prior one, has been generally adopted; and, not desiring again to moot the question, I have reverted to my original proposition of calling our fern Trichomanes radicans.

Geographical Range.

This beautiful fern is said to occur in North, Central, and South America, and the West India Islands, abundantly in the islands of the Atlantic, and among the mountains of Nepal in Asia; but there is no record of its having been found in continental Europe, or Africa.

In the British Islands it is confined to three Irish counties. The record of its discovery in Yorkshire a hundred and fifty years ago, is beset with many doubts and difficulties that cannot now be solved.

Cork. — Mr. R. Ball informs me that he found this fern in luxuriant profusion in Glendine, near Youghal. It was found in 1841, by Mr. James A. Fisher, in Glenbour, Killeagh, also near the town of Youghal; it was growing in a cave, and in considerable abundance, Mr. Fisher having supplied several botanists with whom I correspond; but when he again visited the cave, he found that a fire had been kindled immediately under

the spot where the fern was growing, and it had been by this means almost entirely destroyed. In Temple Michael Glen, near Cork, it has been noticed by several botanists; but I am informed by Mr. S. P. Woodward, that in August, 1843, there was very little left: Mr. Woodward also informs me, that at the Cork meeting of the British Association, he saw recent specimens which had been gathered near Bandon, in this county. It has also recently been found by Mr. Carrol, "under a shelf of rocks near the summit of Carrigeena, Kildorrery, in the North of county Cork, at an elevation of 1000 or 1200 feet."—(See Phytol. iv. 78). In the 'Botanist's Guide for the County of Cork' the following additional stations are given: — "At a fall of the small river Clashgariffe, about a mile from where it joins the Lee: Mr. J. Drummond. Beneath a dripping rock in Templemichael Glen, close below the high bridge, about four miles from Cork, very sparingly: Mr. D. Murray. It still exists there. Near Glandore: Dr. G. J. Allman. On the banks of several of the lakes near Bantry: Mr. C. C. Babington.—Very rare."—P. 81.

Kerry.—The celebrated station at Turk waterfall, near Killarney, was discovered by Dr. Mackay, in 1804; he observed the plant in considerable quantity, and producing fruit. This station has been visited subsequently by many botanists and tourists; among the latter tribe I may include myself. I first observed it to the left of the seat whence visitors usually take their first view of the cascade. About fifteen yards higher up the stream, the rocky bank on the left projects into the river; this projection is only to be reached by striding from stone to stone along the bed of the stream, which, in times of flood, as appeared to be the case when I was there, is rather an exciting and ticklish operation. Having reached the projection, I ascended it without difficulty, by the assistance of the boughs and roots of trees; and on the top is a little platform, standing on which I saw the bank close before my eyes robed in Trichomanes. It was a beautiful sight. Captain Jones informs me, that in 1826 he collected specimens two hundred yards above the waterfall. Mr. Wilson, and my lamented friend, Mr. W. Christy, found a third locality in a ravine of Cromaglaun mountain. Mr. Wilson informs me that another station was known to Mr. Scott, and another to Miss Hutchins. Mr. Robson has subsequently found it higher up the stream than the station mentioned by Captain Jones, and that in such plenty as to procure a number of roots, which he has planted abundantly, not only about Killarney, but also about Glengarriff and in Valentia Island. Although the intention in doing this is perhaps a good one, that of preserving in Ireland this interesting species, yet I fear it will scarcely meet with the approbation of botanists generally. I learn from Dr. Allchin, and other English botanists, that it is abundant in a very great number of stations on Turk mountain, even to its very summit, ascending to an altitude of 1500 feet: there is therefore not the slightest probability of its ever

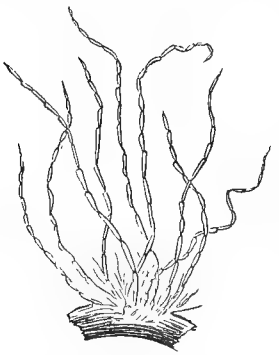
being eradicated, or even of its being perceptibly diminished in abundance. It is very curious, that ten years subsequently to its liberal introduction by Mr. Robson, Miss Helen Blackburn, daughter of the Director of the Valentia Slate Establishment, found it growing abundantly in Valentia Island, in company with Hymenophyllum Tunbridgense; and further, that the plants at Killarney and Valentia agree in all their characters, while those in the intervening district are very dissimilar.—(See Phytol. iv. 1007). Mr. S. P. Woodward informs me that the late Dr. Taylor discovered a station at Gortagaree, between Killarney and Kenmare; the Hon. Deyrolles de Moleynes discovered a station near Dingle, and Mr. Andrews and Mr. Moore found it at Mount Eagle, near the same town; Mr. Andrews has also found it at Blackstones, in Glouin Caragh. For Kerry specimens, and much valuable information respecting them, I am indebted to Mr. Andrews, Mr. Foote, Mr. Ogilby, Dr. Mackay, Mr. Moore, Mr. Dennes, Mr. Pamplin, and Dr. Kinahan. Mr. Andrews and Mr. Foote were travelling in company, when the former discovered the Blackstones locality. The fern was growing in a wild and romantic cave, the rocky walls of which had been for ages covered with a drapery of the overlapping fronds, hundreds of which, hanging gracefully down, formed a pendulous mass of the loveliest green, which contrasted strikingly with the sombre hue of the Killarney plant: the rhizomes, spread over the moist surface of the rock, formed a reticulated and tenacious covering.

Wicklow.—I was informed by the late Mr. W. Thompson, that, according to the MSS. of the late Mr. Templeton, this fern was first found in Ireland by Dr. Whitley Stokes, at Powerscourt waterfall, in this county: at no time did it exist here in any quantity. Dr. Mackay informs me that he has seen a single plant here, as well as at Hermitage Glen, also in this county, where it was first found by Mr. Nuttal. I believe many years have elapsed since any botanist has found it in this locality.

Description.

The radicles and rhizome of Trichomanes radicans a good deal resemble those of Ctenopteris vulgaris: the radicles are black, and clothed with fibrillæ, which, like the claspers of ivy, adhere to the surface of rock: the rhizome is black, tomentose, tough, and remarkably long; I have collected specimens which must have been many yards in length, and I observed that the rhizomes formed a kind of net-work over the surface of a rock, to which the radicles were adherent: this I found to be a character of the plant when most luxuriant, but I discovered other

smaller plants, possessing more radicle and less rhizome, and having the radicles fixed in a thin layer of moist earth, among a profusion of moss and Hymenophyllum. The young frond exhibits itself in a very rudimentary state in the autumn, and at any part of the rhizome except its growing extremity; its full development is not complete until the November of the following year, and it takes another year to produce the seed-vessels; the fronds usually endure for many years. The tomentose covering of the rhizome is found, under a lens of high power, to consist of articulated bristles, which are evidently analogous to the scales on the stipes of other ferns: they may be seen most abundantly on the young frond, before it has unrolled, and may be found scattered here and there on the stipes after the frond has attained maturity: they are of a rich brown colour, the dilated portions being slightly transparent. I have attempted to show the structure of these bristles in the marginal figure. Intermixed with these bristles are others much finer, much shorter, and more transparent; and these, under a lens of sufficient power, are also found to exhibit traces of articulation: the tomentose appearance of the radicles is due to these minute bristles. The form of the fronds is between lanceolate and triangular, those from Glouin Caragh approaching the former, those from Killarney the latter form: they are pinnate, the pinnæ being alternate and pinnate, and the pinnules deeply divided or pinnatifid: perhaps it would be more correct to describe the hard, woody, wire-like veins as thus divided, and to say that each of these veins is furnished on each side with a semi-membranous wing extending throughout its length: the entire frond is composed of these wings, and consequently all its divisions are narrow and linear: this wing extends also to the stipes, which is about equal to half the frond in length. The fructification may be thus described:—the cluster of capsules is small, and nearly spherical, and is attached all round the vein after its ultimate division; at the point of attachment the wing partially loses its green and semi-membranous



appearance, becomes more opaque, and of a whitish colour, and assumes a form something like that of a champagne-glass around the cluster of capsules; the capsuliferous vein passes through this cup, and projects beyond it, often exceeding it four times in length: it is the general custom of botanists to speak of the cup as an *involucre*, and of the bristle-like exserted vein as a *receptacle*.

Varieties.

It has lately been supposed by many excellent botanists, that there are two Irish species of Trichomanes,—the Killarney and the Glouin Caragh plants: I will now proceed to lay before my readers all the information I can collect on the subject, and then allow them to draw their own conclusions. The first notice I find of the Glouin Caragh plant is by Dr. Mackay, at the December Meeting of the Dublin Natural-History Society in 1842. "Mr. Mackay, of the College Botanic Garden, in commenting on the beautiful specimens of Trichomanes exhibited by Mr. Andrews this evening, and on their finely developed state of fructification, observed that the first discovery of this rare and beautiful fern in Ireland was made by him in 1804, about which time he forwarded specimens to Sir Edward Smith, who figured it in the 'English Botany,' under the name of Hymenophyllum alatum, from its winged stem. There was also exhibited before the meeting a true specimen of the Madeira plant, T. speciosum of Willdenow, which the late Right Hon. George Knox had brought to him in 1811: this plant, in the short state of its receptacles, its triangular-shaped frond, and its densely tripinnate pinnæ, was identical with the beautiful specimens in such fine fructification now before them of the T. brevisetum of Killarney. The other specimens were those of a discovery made by Mr. Andrews this autumn, in a district remote from Killarney; and he confessed that he had never before seen such, either from their large size, or from the splendid state of fruit they exhibited. There was another peculiar, and, he considered, distinctive feature, in the lanceolate form that all the fronds possessed, the bipinnate and not crowded state of the pinnæ, and the still more remarkable character

shown, that of the receptacles being five and even six times longer than the indusia. These distinctions (from his own long experience and knowledge of these beautiful ferns, having succeeded for many years in cultivating them to perfection under glass in the conservatory), led him to state that he conceived the specimens produced by Mr. Andrews to be perfectly distinct from T. brevisetum."

The next notice I find on this subject is in the report of the meeting of the British Association, held at Cork in August, 1843. It appears that Dr. Allman on this occasion exhibited specimens of the Glouin Caragh plant, calling attention to the characters already pointed out; and that Dr. Mackay again expressed "his conviction that it was a new species."

Mr. Andrews has obligingly furnished me with the following characters of the two plants: —

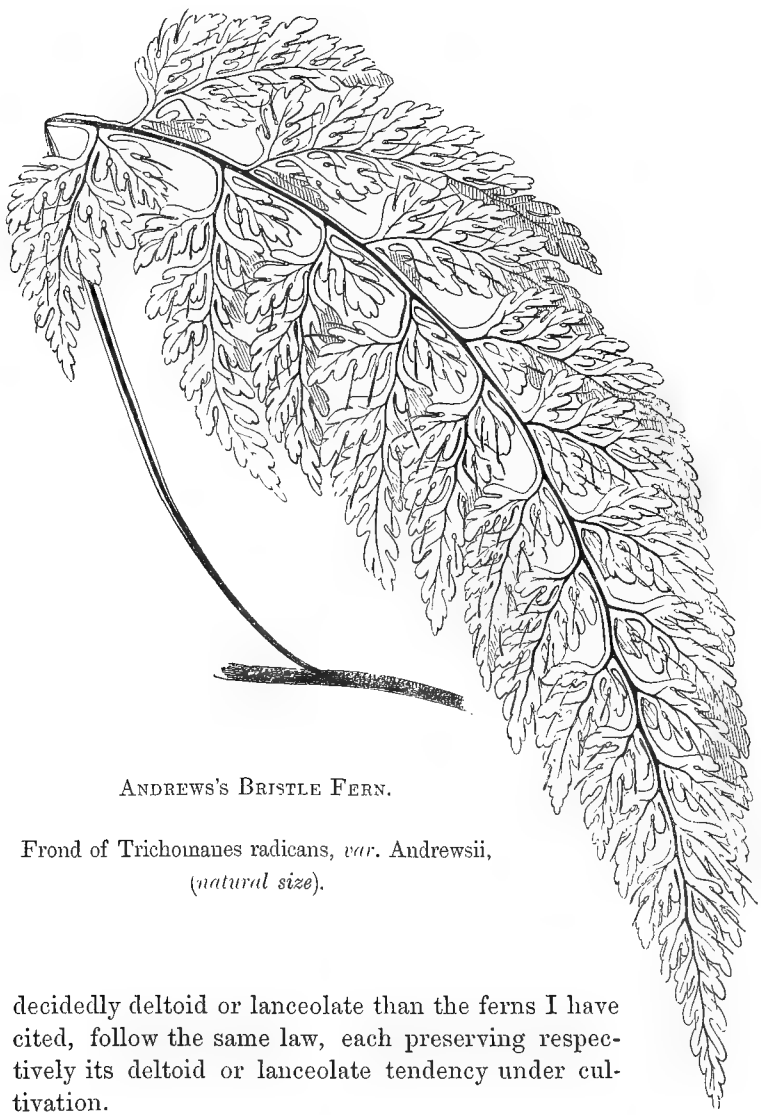
"*Trichomanes speciosum.* Frond angular, thrice pinnated; lowest pinnæ longest, densely crowded and tripinnated; lobes of the pinnæ linear, blunt. Rachis winged, short. Receptacles two or three times longer than the involucra. Root thick, densely tomentose. Habitat Turk, Killarney; Glouin Caragh; Mount Eagle, Kerry.

"*Trichomanes* —— ? Frond lanceolate, twice pinnated; lower pinnæ distant, short, ultimate segments of the pinnæ decurrent, serrated, lobed, linear, acute. Rachis winged, very long. Receptacles six times longer than the involucra. Root long, scarcely tomentose. Habitat, moist rocky cave, Glouin Caragh, Kerry." (See the figure at page 292).

Mr. Andrews further observes, that "the striking character of the Glouin Caragh plant is the amazing length of the receptacles, which, in the growing state of the plant, turn up from the involucre in a curved manner, showing a most bristly appearance over the entire frond: all the fronds presented the lanceolate character, the lower pinnæ being distant and short; the ultimate segments of all the pinnæ are serrated, the pinnules being decurrent and running to a point: the entire length of the frond was sixteen inches, and from the base of the lowest pinnæ to the apex of the frond eleven inches."

In accordance with the views previously urged, I have endeavoured to compare the most mature and perfect fronds from each locality, and the results appear to be the following:—1. That the specimens from Glouin Caragh are far more mature and fruitful than those from Killarney: it is a rare thing to obtain specimens from the latter station in a thoroughly mature state; I think I may say that not one plant in many hundreds attains the perfect development and fruitfulness displayed by the Glouin Caragh plant. But, 2. I find that the most mature of the Killarney specimens most recede from the Glouin Caragh specimens, a circumstance rather opposed to the supposition that the two are identical, since in general we find ferns developing their specific differences more strikingly as they approach perfection. 3. The length of receptacle is another test of perfection: the Killarney plant, grown at Killarney, has a receptacle of very different length; in the most perfect specimens it is at least four times as long as the involucre, in the least perfect it scarcely protrudes beyond the involucre, and under cultivation it is seldom to be seen at all, thus evidently proclaiming that its length in some measure depends on health, maturity, and a congenial situation. Willdenow describes the receptacle of his T. speciosum as four times the length of the involucre; and I cannot assert either that its frequent departure from this character at Killarney proves anything more than that such departure is a testimony of imperfection, or its attaining this character at Glouin Caragh is to be attributed to any other causes than congenial situation. The form of frond, as Mr. Moore of Glasnevin believes, may be capable of great elongation; but there is no evidence that the relative length of the pinnæ is also altered: it appears to be a fundamental character of a deltoid frond that the lowest pair of pinnæ shall be longer than the second pair, the second longer than the third, and so on: and, as far as I am aware, this character is constant in cultivation; at least, I can safely assert that it is so in Asplenium Adiantum-nigrum, A. acutum, and all the deltoid Aspleniums. The apex of the frond is often lengthened very remarkably, but the lower pinnæ almost invariably partake of a similar elongation. In lanceolate fronds, the lowest pair of pinnæ are usually shorter than the second pair, the second than the third; and this character, in Asplenium lanceolatum, A.

Halleri, and all the lanceolate Aspleniums, remains unaltered under any condition. Now the two Trichomanes, although less



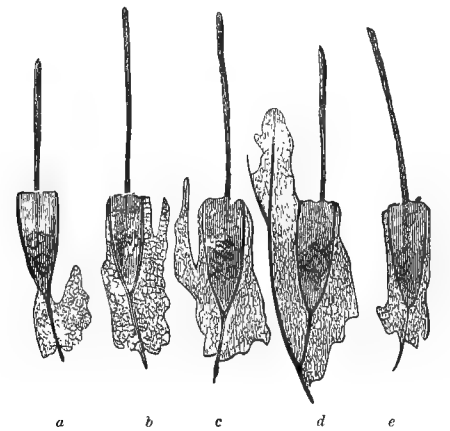
ANDREWS'S BRISTLE FERN.

Frond of Trichomanes radicans, *var.* Andrewsii, (*natural size*).

decidedly deltoid or lanceolate than the ferns I have cited, follow the same law, each preserving respectively its deltoid or lanceolate tendency under cultivation.

Again, there is a decided difference, as far as I can learn from my limited materials, in the involucres of the two plants. In

the Killarney plant the involucre stands out distinctly from the membranous frond, and appears almost stalked; while in all my specimens of the Glouin Caragh plant, it is more or less united with the frond by a continuous margin or wing: this will, perhaps, become more evident from an inspection of the magnified figures below.



a. Involucre of the Killarney plant. *b*, *c*, *d*, *e*. Involucres of the Glouin Caragh plant.

Culture.

The cultivation of this beautiful fern has occupied the attention of many botanists: I believe Dr. Mackay of Dublin, and Mr. Ward of London, were the first whose efforts were attended with success. Mr. Ward possesses a plant, which for many years has been in the most healthy and vigorous condition, but it has rarely shown any indication of producing seed. Mr. Andrews appears to have been still more successful. He says: —"In September, 1841, I formed a case purposely for cultivating this fern. I lined the bottom with zinc, and covered the frame-work with oiled lawn. I then planted my specimens in well-drained pots, in a compost of loam and coarse sand, interspersed with pieces of turf. I also suspended the roots across the roof of the case, attached to rods covered with bass matting

and moss. The plants were kept cool, and were well moistened daily, and I have now (Oct. 24, 1843) a splendid display, the entire case being filled with fronds of large and strong growth. No other fern will thrive well in the case with the Trichomanes, the treatment required to cause the Trichomanes to flourish being destructive to the other. The Trichomanes will *live* or even *grow lazily* in a glass with other ferns, but will never attain a vigorous state of growth. The cultivators of Trichomanes are under a mistake in supposing that the plant was in a fine state of fructification, merely because the involucra had been produced. I have never seen the setæ perfectly exserted in cultivation, and the capsules attached in a ripening state. It was late in September when I discovered the Glouin Caragh plant, and I collected a quantity of the capsules, but I could not detect the sporidia thrown out by the bursting of the ring of the capsules."

The main object to be achieved in the cultivation of this beautiful fern, is an atmosphere loaded with moisture. In the drier counties of England, this can only be maintained by a constant covering of glass. Several plans have been tried for accomplishing this. I will describe two, which I would wish particularly to recommend.

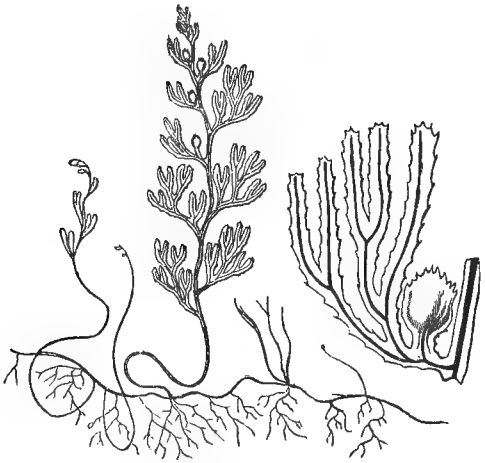
No. 1.—A small greenhouse, with brick walls, North aspect, corrugated glass, and the sun's rays totally excluded. Arrange upright strips, about an inch thick, of stone, slate, or zinc, against the bricks: on these strips fasten galvanized zinc wire netting: there will be a space between the netting and the bricks about an inch deep; fill this very carefully with Sphagnum thoroughly saturated with water, and on the face of the Sphagnum arrange the rhizomes of the Trichomanes, which will be held in their places by the elasticity of the Sphagnum and the pressure of the netting. If the brick wall be built for the purpose, the taste of the builder will suggest various improvements on a plain surface. Mr. Allis, of York, has the upright strips *of wood*, and has been very successful; but I do not like wood so well as any material that is not liable to decay, rust, or harbour insects.

No. 2.—Procure a very large earthen pan, glazed within; fill this with water, and in the water arrange shells, crystals of quartz, aquatic Ranunculi, aquatic moss, Charas, &c., so as to

hide the pan; then introduce say two small gold carp, two crucian carp, six sticklebacks, and a dozen water-snails: I am particular in stating numbers, because any attempt to over-load the water with animal life, will exhaust its power of supporting it, and this water is never to be changed. Procure a second pan, about half the size of the first, and totally unglazed; support this on three or four pedestals of stone placed in the water of the first pan, but let the water of the first just touch the bottom of the second: in this second pan arrange pieces of freestone, wet Sphagnum, mosses, Hymenophyllums, and a little very damp earth, composed of sand, leaf-mould, and peat, and among this introduce the rhizomes of the Trichomanes: the second pan will appear as a large island in the first. Now cover the whole with a bell glass, if you can procure one large enough, if not, a large hand-glass must be made on purpose; but whatever the glass, cover it again with flannel. Never leave the plant uncovered, and *never water;* the exhalation from the water will rise, and keep the plant in a constant vapour-bath.

No. 3.—A third plan is recommended in the 'Phytologist' by Mr. Callwell. "Mr. Callwell observed that the statements he was about to make, were upon the experiments and the successful results of his several modes of treatment of the cultivation of that beautiful fern. In the year 1842, Mr. Andrews had given him a plant having two fronds, one about six inches in length, the other partially developed. These he placed under a bell-shaped glass shade, which was about fifteen inches in diameter and eighteen inches in height. The fern was planted in pure maiden earth, or virgin mould, a good drainage being formed by placing inverted flower-pots in the receiver: through this mould he interspersed portions of charcoal. The temperature and moisture were carefully regulated, although but little watering was given to the plant. Great care was taken to keep the growing fronds from contact with the glass, for so delicate and sensitive were the beautiful fronds when expanding, that should they rest against the glass they became blackened and unsightly. In the spring of 1845, so luxuriantly had the plant extended, that he removed the mass to a larger case. At that time there were about twenty fronds, all fully developed, and presenting that beautiful green hue and delicacy of texture which are the remarkable characteristics of the plant.

The new habitat was a case, of a neat mahogany frame, glazed on all sides, and having a deep tray of zinc; its measurements were three feet nine inches long, two feet six inches broad, and three feet three inches high, having a depth of tray or receiver ten inches. Height in the case he considered of much importance for the proper encouragement of growth. The zinc tray was placed on a strong floor; the mass of plants were laid in soil similar to that above described, with the charcoal throughout, having previously put as before the inverted flower-pots, and the addition of cocoa-nut husks, so as in every way to facilitate perfect drainage. It was of great importance to the healthy growth of the plants to prevent any lodgment of moisture in the mould, or any tendency to the mould souring from undue excess or retention of moisture. To avoid this, he had placed around the case a rim of zinc, and by judiciously placing skeins of worsted the drainage was directed to a proper course, and the water easily carried off by means of a stop-cock, which could be turned when necessary. Other most important measures were to regulate light and temperature. The case was placed in a lobby, where it received only a subdued light, with but partial rays of the sun through the medium of green glass, and where the temperature was generally even throughout the year, for the plants would not bear any degree of heat; thus moisture, an equable temperature, and a modulated light were the essentials for effective growth. It would appear, when Mr. Andrews had made the discovery of such splendid plants in Kerry, that a shaded moist temperature was the delight of this fern. The fronds in Mr. Callwell's case were not so large or so fine as the specimens found by Mr. Andrews, but his was a new station in Iveragh, and those he cultivated were from Killarney. He should have mentioned, that in forming the compost for the plants, he had raised a kind of mound towards the centre of the case, that the plants might be better seen, and now the entire case was filled and covered with the fronds. In the winter of 1849 he suspended from the roof of the case a block of wood, and to this he attached a plant, which had now crept over the wood with its rhizomata, and was spreading its roots in all directions."—Phytol. iv. 164.



TUNBRIDGE FILMY FERN, (*natural size*).

Characters.

Genus. — HYMENOPHYLLUM. Involucre obese, obtuse, bivalved: receptacle or capsuliferous vein not produced beyond its margin.

Species. — TUNBRIDGENSE. Rhizome filiform, creeping extensively: frond drooping, pinnate: pinnæ alternate, flat, spreading, composed of a dichotomously divided, stiff, wiry vein, accompanied throughout by a membranous wing, serrated along its margin: involucres in the axils of the pinnæ, subrotund, flattened, serrated at top.

Synonymes, Figures, &c.

Trichomanes tunbridgense, *Linn. Sp. Pl.* 1561; *With. Arr.* 781.

Trichomanes tunbridgense, *Huds. Fl. Ang.* 461, ad partem.

Hymenophyllum tunbridgense, *Sm. E. F.* iv. 326, *E. B.* 162; *Mack. Fl. Hib.* 345; *Franc.* 60; *Newm. N. A.* 29, *F.* 321; *Phytol. App.* xxx.; *Hook. and Arn.* 577; *Bab.* 416; *Moore*, 207.

The figure of this fern in 'English Botany' (E. B. 162) is sufficiently exact, and that in Hooker's 'Flora Londinensis' (t. 71), is still better.

This plant is the Trichomanes tunbridgense of Linneus (Sp. Pl. 1561), Hudson (Fl. Ang. ii. 461), and many of our earlier authors: it was separated by Smith as a genus in the fifth volume of the 'Turin Transactions' (Acta Taur. v. 418), and the name has been adopted by nearly all subsequent botanists.

Geographical Range.

A species of Hymenophyllum occurs under the name of H. tunbridgense, in the Floras of Germany, France, Italy, and Sweden. From the 'Flore Française' we learn that in France it grows amongst moss on the trunks of trees; and a closely-allied species, often indeed bearing the same name, is abundant in the Atlantic islands, and occurs in Africa, at the Cape of Good Hope, in Valdivia, Chili, the Organ Mountains in Brazil, and other parts of South America, in the Mauritius, various parts of Van Diemen's Land, and New Zealand.

This little moss-like fern is generally found growing on the surface of rocks and stones, in moist and shady situations: but I also observed it near the West Hoathly rocks, growing abundantly on the surface of the soil under the shade of the common ling; and in Ireland, it has repeatedly been seen covering the branches of decayed trees. Unfortunately, in my endeavours to draw up a summary of habitats, I can derive but little assistance from prior records: the learned authors of the 'Botanist's Guide' do not distinguish between this and the following species; and the authors of many later records are evidently unable to apply the names with precision. The English and Welch habitats of H. tunbridgense have been supplied by correspondents on whom I can confidently rely.

In Scotland, this pretty little fern does not appear to be of common occurrence: the following habitats have been kindly supplied me: —

Argyleshire. — Mr. Gourlie informs me he has found it at Bullwood and Dunoon.

Dumbartonshire. — Mr. Gourlie has met with it abundantly on the banks of Loch Lomond.

DUMFRIESSHIRE.—Mr. Cruickshank has found it on rocks at Drumlanrigg Bridge.

Descending into ENGLAND, we find it in two northern counties,—Yorkshire and Lancashire; then in two Welch counties, — Merionethshire and Glamorganshire; next in two western counties, — Devonshire and Cornwall; and, lastly, in two south-eastern counties,—Sussex and Kent: in the latter county, it grows only in one very restricted locality, closely bordering on Sussex. Somersetshire, a recorded county, requires confirmation.

YORKSHIRE.—Mr. Spruce informs me it has been found by Mr. Peterkin on rocks, by a stream running down to the sea, at a place called Hayburn-wyke, near Whitby; Mr. Wilson has found it near Halifax, and near Greenfield; and the late Mr. S. Gibson near Todmorden. I have several other communications from this county, most of them simply confirmatory of the foregoing.

LANCASHIRE.—The late Mr. S. Gibson found it at Cliviger; Mr. Sidebotham sparingly in caves at Greenfield; and Mr. Simpson near Coniston.

MERIONETHSHIRE.—Mr. Wilson informs me he has received specimens from Crofnant, near Harlech; Mr. Ralfs, that he has found it near Dolgelly, and near Barmouth; and Mr. H. C. Rothery in the vale of Festiniog: to these localities I may add Rhayadr Du, near Maentwrog, where I observed it in some abundance above the fall.

GLAMORGANSHIRE.—Mr. Westcombe informs me that he found it at the Melincourt waterfall; and Mr. E. Young adds that it grows in a large patch on a stone in the middle of the stream, close to the fall, and that he has also found it at Brincon's, and at the Cill Hepste waterfall. It may be added, that one of the species, but I cannot satisfactorily ascertain which of them, occurs abundantly at Pont-nedd-Vecchn.

DEVONSHIRE. — The Rev. W. S. Hore has found it, in company with H. unilaterale, on rocks adjoining the Plym, near Shaugh Bridge; and Miss Griffiths has observed it at Bickleigh Vale, South Devon.

CORNWALL.—Mr. Babington and Mr. Borrer inform me that they have found this species at Rough Tor, near Camelford, and Mr. Bowden has supplied me with a fine mass of the plant from near this locality; Miss Warren has met with it in two places in a wood near Penryn; and Mr. D. Peirson at College Wood, near Penryn: several other communications confirm these localities, and rather extend the Cornish range of the species.

SUSSEX. — This little fern was formerly most abundant upon the High Rocks, at Tunbridge Wells, but large masses of it have been rolled off the rocks, like blankets, insomuch that it is now found but sparingly in this, its original and once profuse locality; it still occurs abundantly on the sandstone rocks at West Hoathly, Ardingly, and Handcross; at the first of these, remarkable for the rock called "Big-upon-little," I found it abundantly in August, 1853.

KENT.—Just within the limits of the county, at Tunbridge Wells.

In IRELAND, this fern is not generally distributed, being confined to those romantic parts of a few counties which have for many years attracted the notice of tourists.

CORK.—The following stations are given in the 'Botanist's Guide for the County of Cork:'"—"At Ballinhassig waterfall: Mr. J. Drummond. Lota Wood and Dunbullogue Glen, Cork: Mr. D. Murray. Glenbower, Killeagh, in very great luxuriance: Dr. Power. It is still to be found in all these stations.—Rather rare."—P. 81.

KERRY.—In the vicinity of Killarney it attains a degree of luxuriance and profusion that I have never observed elsewhere: it is often mixed with Trichomanes radicans: it not only covers the rocks, but even clings to the bark of trees, ascending the branches to a great height, and presenting a very beautiful appearance.

WICKLOW.—Dr. Mackay informs me it occurs at Powerscourt waterfall, Glencree, and several other places in this county.

Description.

The radicles are black, wiry, and very slender: the rhizome is long, black, slender, wiry and creeping. The fronds consist of branched series of veins, each being clothed with a membranous or filmy wing, the structure in this respect being exactly similar to that of Trichomanes: the branches or pinnæ are alternate, and each is more or less subdivided; the divisions or pinnules are mostly in pairs; the margin of the wing is crenate or denticulate. The clusters of capsules are nearly round, and each is seated almost at the extremity of a short vein, which in each pinna is next adjoining the midrib of the frond. The wing, or membranous portion of the frond, is divided below the cluster of capsules, and incloses it as in a kind of cup, which is usually called the involucre: the upper margin of this involucre is notched and uneven; the capsuliferous vein or receptacle does not extend beyond the margin of the involucre.

WILSON'S FILMY FERN, (*natural size*).

Characters.

Genus.—HYMENOPHYLLUM. (See page 297).

Species.—UNILATERALE. Rhizome filiform, creeping extensively: frond semierect, pinnate: pinnæ alternate, secund, unilateral, consisting of a dichotomously divided, stiff, wiry vein, accompanied throughout by a membranous wing, serrated along its margin: involucres pear-shaped, seated in the axils of the pinnæ, entire at the top until mature, then dehiscent, the valves widely separating.

Synonymes, Figures, &c.

Trichomanes tunbridgense, *Lightf. Fl. Scot.* 681; *Huds. Fl. Ang.* 461, ad partem; *Bolt. Fil. Brit.* 58, t. 31.

Hymenophyllum unilaterale, *Willd. Sp. Pl.* v. 521; *Newm. F.* 14, *Phytol. App.* xxx.; *Moore*, 209.

Hymenophyllum Wilsoni, *Hook. Brit. Flor.* 446, *E. B. S.* 2686; *Mack. Fl. Hib.* 345; *Franc.* 61; *Newm. N. A.* 29, *F.* 325; *Hook. and Arn.* 577; *Bab.* 416.

There is a very good figure of this fern in 'English Botany' (E. B. S. 2686).

With respect to the name, British authors seem agreed in calling it H. Wilsoni; but, numerous as are our descriptions under this name, and excellent as is that by Mr. Wilson in the 'Supplement to English Botany' (E. B. S. 2686), still, not one appears to me so exact and accurate as Willdenow's, of his species H. unilaterale, (Sp. Pl. v. 521). I have never seen authentic specimens of Willdenow's plant, which that author does not mention as an inhabitant of Europe.

The species, as British, was first distinguished from the preceding by Mr. Wilson, who, in a letter to me, observes: — "I have had considerable difficulty from the very first in procuring for Hymenophyllum Wilsoni [unilaterale] an exact description: the pinnæ are not pinnatifid, as in H. tunbridgense, but more properly of a lobed or triangular form (rhomboid in the other species). It may perhaps aid the illustration to say that H. tunbridgense has the pinna with a central axis, while nothing of the sort can be detected in H. Wilsoni [unilaterale]; and that if you were to cut away the outer half of the pinna of H. tunbridgense, you would then reduce it to the shape of H. Wilsoni [unilaterale]. By this character the species may be recognised in a barren state."

Geographical Range.

The range of H. unilaterale is coextensive with that of H. tunbridgense, it having been found in the most distant parts of the globe; and it is a circumstance worthy of note that the two species are generally found growing near each other. H. unilaterale occurs in Europe, Africa, New Holland, and South America. I have no Asiatic habitat; and it is a little remarkable that no Hymenophyllaceous plant is mentioned in the 'Flora Rossica,' a carefully compiled Flora of a larger tract of country than is contained in any other professing to be geographically or politically restricted.

The range of this species in Great Britain appears to be much more extensive than that of H. tunbridgense: it also seems to be a more northern species, and generally to prefer a greater elevation and more exposed sites: still, as already

stated, the two plants are often found in close proximity, particularly about the waterfalls in the vicinity of Killarney.

Shetland Isles. — The late Mr. Edmondston stated that he had "observed it in one place overhanging a subalpine stream near Ska, Unst, in great luxuriance and abundance."

Orkney Isles.—Mr. Babington, in company with Dr. Balfour, found this species on the summit of Langa, in Harris, at a probable elevation of 2700 feet.—(See Cat. Heb. pp. 8 and 23).

On the main land of Scotland it has been found in the undermentioned counties, and its absence from many others is only conjectural.

Perthshire.—Mr. Gourlie and many other botanists have collected it on Ben Lawers.

Argyleshire. — Mr. Babington has found it at Crinnan, and Mr. Adamson at Dunoon.

Dumbartonshire. — Mr. Gourlie has met with it abundantly on rocks on the banks of Loch Lomond.

Renfrewshire. — Mr. Gourlie has found it on rocks and hills above Gourock.

Dumfriesshire. — It has been found by Mr. Babington and Mr. Cruickshank in Girpel Lane, Kirkpatrick-juxta.

Descending into England, we find it in four northern counties.

Cumberland. — Mr. Watson gives me Scale Force as a locality; the Rev. Mr. Pinder speaks of it as of common occurrence on the rocks and screes; in addition to Scale Force, he mentions Scaw Fell, High Still, Honister Crag, Gatesgarth Dale, Borrowdale, &c.

Westmoreland. — Mr. Bowerbank observed it on Ambleside; Miss Beever has found it at Stock Gill and Dungeon Gill; and Mr. Pinder speaks of it as not uncommon in the county.

Yorkshire.—The late Mr. S. Gibson informed me that he found it at Turner's Clough, seven miles from Halifax, on the Oldham road; Mr. J. Backhouse, jun., on rocks near Lower Harrogate; and Mr. Wilson near Greenfield.

Lancashire.—Miss Beever and Mr. Pinder have found it on the Old Man mountain; Mr. Sidebotham sparingly in caves at Greenfield; Mr. Simpson commonly near Lancaster; Dr. Wood on hills near Bury; and the late Mr. S. Gibson at Thevilly, near Burnley.

Passing into Wales, it is credibly reported from five counties.

Caernarvonshire. — As far as I am able to decide, I should say that the very numerous habitats in the vicinity of Snowdon, Llanberis, Cwm Idwell, Nant-Frangon, &c., although generally accompanied by the name of H. tunbridgense, belong exclusively to the present species. I formerly supposed I had found H. tunbridgense in Caernarvonshire, but, on referring

to the specimens, can only find the present species, which is most abundant on rocks and stones throughout the Snowdon district, at Rhayadr-y-Wenol, falls of the Lugwy, Capel Cerig, Rhayadr-Mawr, near Llanberis, &c.

Merionethshire. — I have observed it in abundance at Rhayadr Du near Maentwrog, and at Rhaidr-y-Mawddach near Llaneltyd; and Mr. H. C. Rothery found it, growing in company with H. tunbridgense, in the vale of Festiniog.

Cardiganshire.—Mr. Lees has observed it in some quantity on rocks close to Pont Bren, or the Parson's Bridge.

Brecknockshire. — Mr. Ralfs informs me it is common among the mountains in this county.

Glamorganshire.—On rocks some way below the Melincourt fall, and also on rocks near the Scud-einon-Gam: Mr. E. Young.

Returning into England, we find this species in two western counties.

Devonshire.—The Rev. W. S. Hore and Mr. Ward inform me that it occurs, in company with H. tunbridgense, upon rocks and large blocks of granite adjoining the Plym, above Shaugh Bridge, and, Mr. Hore adds, in much greater abundance, at Westman's Wood, Dartmoor; Mr. Ralfs and Mr. Borrer have also found it in ravines at Dartmoor; and Miss Griffiths at Tynemouth, North Devon, and Bickleigh Wood, South Devon.

Cornwall.—Miss Warren has found it at Granite Tor; Mr. Ralfs and Mr. Greenwood at Carn Brea, near Redruth; Mr. Babington and Mr. Borrer in abundance at Rough Tor, near Camelford.

In Ireland this fern is much more common than in England, and grows with a beauty and luxuriance that I have not witnessed elsewhere: it is more generally distributed over the island than H. tunbridgense, and whereas H. tunbridgense exhibits something like a preference for shade, warmth and shelter, H. unilaterale establishes itself on bleak and exposed rocks. I subjoin a few localities.

Donegal. — The late Mr. Templeton found a Hymenophyllum on the Ennishowen mountains, which the late Mr. W. Thompson believed to be this species.

Londonderry.—Mr. Moore possesses specimens collected in this county.

Antrim. — The late Mr. W. Thompson thought this to be the species noticed in the MSS. of the late Mr. Templeton, under the name of H. tunbridgense, as having been found by him in Colin Glen, near Belfast: at the time the record was made, the name of tunbridgense was applied to both species. Mr. Templeton also found it by the Glenarve river, near Cushendall.

Down.—The late Mr. W. Thompson informed me that he collected this species in Tullamore Park, and on the Mourne mountains.

Fermanagh.—The late Mr. W. Thompson informed me that the Hon. J. L. Cole found this species near Florence Court.

Galway.—Dr. Mackay has found it in Cunnemara; and I have seen specimens from Marm, Roundstone, and Oughterard.

Wicklow.—On many of the rocky hills and waterfalls in this county, at Glendalough, Hermitage Glen, and Powerscourt waterfall,

Kerry.—On rocks and on trees, ascending to their very summits, among the Kerry mountains, and at all the waterfalls about Killarney; also in Valentia island.

Cork.—Abundant in the glens near Youghal.

Description.

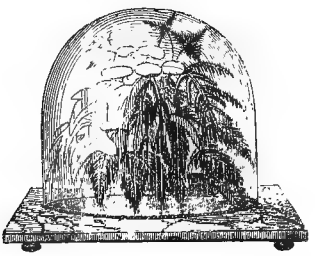
The radicles and rhizomes of H. unilaterale offer no characters by which I can distinguish them from those of H. tunbridgense: the fronds of both are circinate; they make their appearance late in the summer months, and usually remain green throughout the winter, turning completely black in the ensuing summer. The frond consists of branched veins, clothed with a membranous wing, the margin of the wings being serrated: the wing on the main rachis is less apparent in unilaterale than in tunbridgense; the pinnæ are always convex above, while those of tunbridgense are usually flat: unilaterale has a more erect habit, tunbridgense a more horizontal, and is, indeed, somewhat drooping, so that, on the trunk of a tree, the fronds seem to rest one on another, like the tiles of a house. The involucre is very different from that of tunbridgense; it is elongate, swollen at the base, and its exterior margin perfectly without serratures; when the capsules are mature, it opens at the top, and, splitting down the middle, remains widely gaping.

Culture.

These are very pretty and very easy ferns to cultivate: they may be used as an undergrowth or ground-covering for Trichomanes radicans, but succeed equally well alone. The following plan will be found successful:—First, fill an ordinary flower-pot with wet Sphagnum, and invert it; then having prepared a compost of silver sand, loam, and peat earth, saturated with water, and mixed to a similitude of mortar, and having

plastered this all over the inverted pot, arrange the matted mass of rhizomes of the Hymenophyllums over the wet surface of the mortar, taking especial care that the fronds hang in a natural position. It sometimes happens that the mass of ferns will not apply itself closely to the mortar; in which case, a piece of fine galvanized zinc wire may be bound twice or three times round the pot, fern, and all, taking care not to injure the fronds, which may readily be so arranged as entirely to conceal the wire: then fill a saucer with wet Sphagnum, and strew the surface with silver sand; place the prepared inverted pot in the saucer, and cover with a bell glass, the rim of which will sink into the Sphagnum in the saucer: the luxuriant growth of the fern is certain. My friend, Mr. Richard White, has cultivated both the species of Hymenophyllum most successfully in this way for eight or nine years.

The same mode of culture will serve for both species of Hymenophyllum, with this difference, that whereas the fronds of tunbridgense are injured by water, except as conveyed in the form of atmospheric humidity, those of unilaterale delight in frequent syringings.



FLOWERING FERN, (*fructification only, natural size*).

Characters.

Genus. — Osmunda. Caudex solid, enduring, erect: fructification upon a portion of the frond in which the veins alone remain, the parenchyma being apparently represented by clustered, globose, reticulated capsules, which are not provided with an elastic ring: involucre none.

Species. — Regalis. Caudex very large, tufted: stipes woody, as long as the frond: frond nearly erect, and, including the stipes, from four to ten feet high, pinnate: pinnæ opposite, spreading, pinnate: pinnules alternate, ovate, attached by the midvein only, very entire: terminal panicle of capsules golden coloured, large, very conspicuous.

Synonymes, Figures, &c.

Osmunda regalis, *Linn. Syst. Nat.* 1521; *Lightf. Fl. Scot.* 653; *Huds. Fl. Ang.* 449; *Bolt. Fil. Brit.* 6, t. 5: *With. Arr.* 763; *Sm. E. F.* iv. 327, *E. B.* 209; *Mack. Fl. Hib.* 345; *Franc.* 63; *Newm. N. A.* 29, *F.* 331, *Phytol. App.* xxxi.; *Hook. and Arn.* 578; *Bab.* 417; *Moore*, 211.

There are good figures of this fern in Bolton (Fil. Brit. t. 5), in 'English Botany' (E. B. 209), and in Hooker's 'Flora Londinensis' (t. 150), besides many of the continental works.

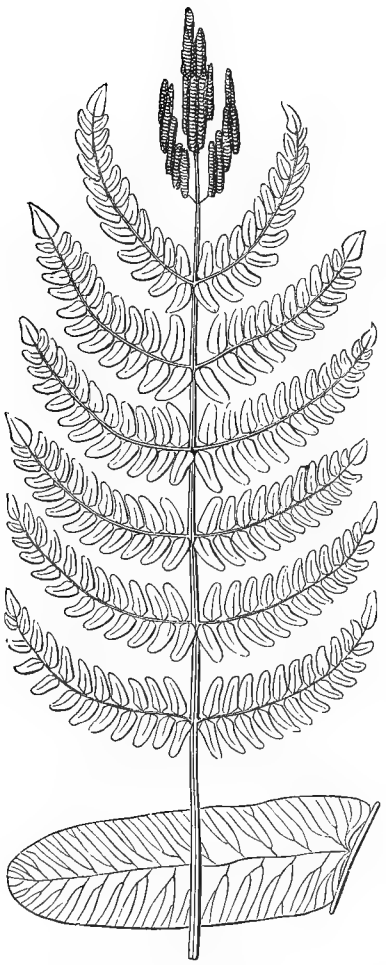
All authors appear to be agreed in adopting the name of Osmunda regalis: the word *Osmund* is supposed to be derived from the Saxon *mund*, signifying strength: the caudex, when cut through, has a whitish centre or core, called by old Gerarde, in his 'Herbal,' "the heart of Osmund the Waterman:" my lore is insufficient to furnish my readers with the history of the said Osmund.

Geographical Range.

This noble fern is of common occurrence throughout Europe, and a plant very similar, and generally bearing the same name, is found in the United States of North America.

It is so generally distributed over the British Islands, in swampy places, that I forbear publishing the immense list of localities with which I have been furnished through the kindness of correspondents. In Ireland, particularly in Connaught, it is most abundant: in Cunnemara I have often observed it covering the small islands in the lakes with a dense mass of its luxuriant fronds, those in the centre being more erect, those around the margins more pendulous. Of the pendulous habit I noticed a beautiful instance at Killarney, where it completely fringes the river between the lakes, and certainly forms a most prominent feature in that lovely but neglected portion of Killarney's far-famed scenery. So altered is the usual character of this fern, that its long fronds arch gracefully over, and dip their masses of seed in the crystal water, while the saucy coots, from beneath the canopy thus afforded them, gaze fearlessly on the visitors who are continually passing by. One of the boatmen employed by Sir Walter Scott, on the occasion of his visit to Killarney, told me that Sir Walter scarcely uttered a syllable in praise of the scenery until he came to this spot; and here he stopped the rowers, and exclaimed, "*This* is worth coming to see!" In the island of Achill, this fern very often fringes the little streams which descend from the mountains, rarely, however, rising above their water-worn channels, and thus escaping the violence of the mountain winds: in a sheltered farm in the possession of Mr. Long, it has forsaken these water-courses and established itself in the fields, where he found it a troublesome weed, and very difficult to eradicate. I was amused to see it towering above his cabbages and potatoes, and intermixed with his oats and wheat. In Scotland this beautiful plant is also common, and often grows to a gigantic size: on the banks of Loch Fyne, where its habit is comparatively rigid and erect (as represented in the figure at page 310), I have measured fronds eight feet in height. In the bogs of Lancashire it is abundant but less luxuriant, and it occurs not uncommonly in all the northern counties of England; it is also of frequent occurrence in North and South Wales, Cornwall, and Devonshire, and is scattered in hundreds of localities throughout the southern counties approaching the vicinity of London, on Epping Forest, Keston Heath, and Kavanagh Wood, near Brentwood, a locality known to old Gerarde.

Description.



The radicles are strong and fibrous: the caudex is tufted, and very large, as might be anticipated from its capacity of annually producing such a weight of foliage; this caudex, in marshy situations, and when shaded by alders and other trees, rises full two feet above the surface of the ground, exhibiting an appearance somewhat like that of the tree ferns: I possess a living caudex of this fern that was found at West Hoathly, the upper part of which is naturally coated with Hymenophyllum tunbridgense. The young fronds, varying in number from six to twelve, make their appearance in May, arrive at maturity in August, and are destroyed by the first frosts of winter; their growth is remarkably rapid and vigorous, and, until nearly full grown, they have a reddish colour, like the shoots of many herbaceous plants: the fronds are fertile and barren; in both the length of stipes and frond is about equal. The fertile frond is linear and pinnate: the pinnæ are four or five pairs in number, generally opposite, linear, and pinnate; the pinnules are linear, generally alternate, attached by the midvein only, rounded at the apex, with the exception of the apical pinnule. The apex of the frond is composed of a compact cluster of spikes; these spikes

correspond to pinnules, of which only the midvein and a slight marginal wing is present, and to each of the lateral veins is attached a nearly spherical cluster of capsules: these clusters entirely supersede any leafy portion in pinnæ so converted; frequent instances, however, exhibit the apex of a pinnule in a leafy or barren state, while the base is fertile: in an early stage of the frond these spikes appear crowded and pressed together, as represented at page 310, but they soon become more lax and diffuse, and at last entirely lose their rigid compressed appearance. The barren frond differs in having the leafy portion continued to the very apex, where it terminates much as in the true ferns. The venation in a barren pinnule is shown in the lower part of the cut at page 310, where it will be seen that the lateral veins branch alternately from the midvein, soon after leaving which each is forked, and one or both of the branches is usually again divided, and all the branches run in parallel lines to the extreme margin of the pinnules.

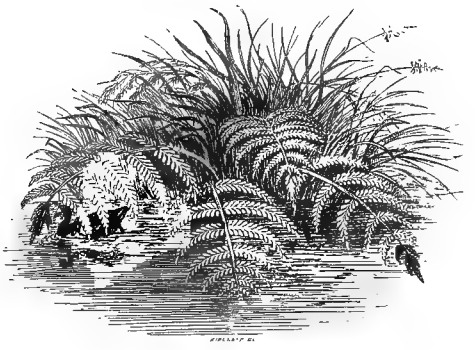
Culture.

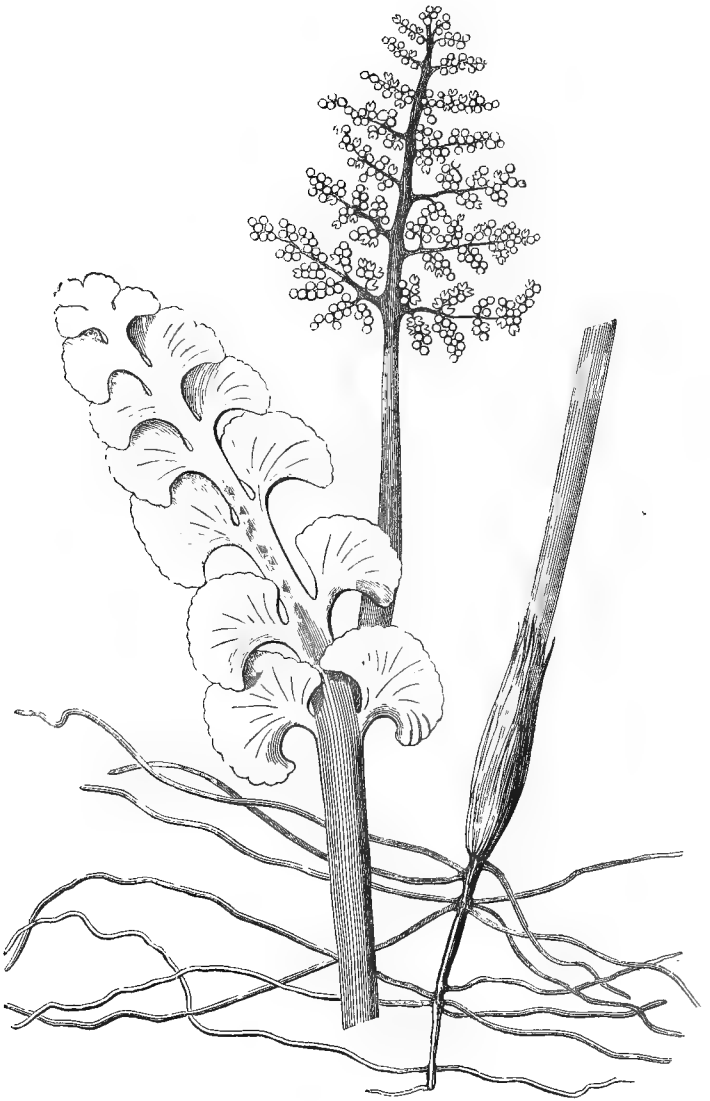
Although strictly a bog fern, Osmunda will live in the ordinary soil of any garden; but in order to make it not only live but thrive, care must be taken to supply it with peat or bog-earth, well saturated with moisture. My kind friend, Mr. Ward of Clapham Rise, has arranged an artificial water-course with such skill and judgment, as to grow Osmunda and other bog plants in the most luxuriant manner. He has here "imitated the natural conditions of plants" so successfully, that he has truly "made the desert" of a London garden to "blossom as the rose."

Economical Uses.

The medicinal properties of the flowering fern are not noticed in Ray's 'Synopsis,' indeed, they are seldom alluded to by the older botanists: we are, however, favoured by Gerarde with the following particulars: — "The root, and especially the heart or middle part thereof, boiled or else stamped, and taken

with some kinde of liquor, is thought to be good for those that are wounded, dry-beaten and bruised; that haue fallen from some high place: and for the same cause the Empericks do put it in decoctions, which the later Physitians do call wound drinks: some take it to be so effectuall and of so great a vertue as that it can dissolue cluttered bloud remaining in any inward part of the body, and that it also can expell or driue it out by the wound." — Ger. Em. p. 1132. It is not mentioned by Dr. Lauder Lindsay in his paper on the "Medical Properties of Ferns," published in a late number of the 'Phytologist,' (Phytol. iv. 1062); but Mr. Buchanan informed me that it is collected in Cumberland, and, under the name of 'bog onion,' is extensively used as a vulnerary. This use of the fern is also mentioned in the 'Phytologist,' in the Report of a meeting of the Phytological Club; where it is stated by Mr. Bywater, of Coniston, that "in Westmoreland, and also the adjoining division of Lancashire known as Lancashire North of the Sands, the rhizomes of Osmunda regalis are in high popular esteem as a remedial agent. The plant is vulgarly known under the name of 'bog onion.' It is used in the following way, as an external application for bruises, sprains, &c.: — The rhizomes are beaten, and being covered with 'cold spring water,' allowed to macerate all night, the resulting thick starchy fluid is then used to bathe the affected parts."—Phytol. v. 30.





MOONWORT, (*natural size of a large specimen*).

Characters.

Genus.—Botrychium. Caudex (?) slender, descending perpendicularly: roots stout, succulent, unbranched, their arrangement on the caudex (?) subverticillate, their direction horizontal amongst the radicles of grasses, to which they appear parasitically (?) attached: caudex (?) surmounted by a loose sheath, which incloses the base of the erect succulent stipes: frond produced *within* the base of last year's stipes, composed of two branches, the outer one barren, leafy, the inner, a racemose panicle of spherical, distinct, sessile, crowded, bivalved capsules.

Species.—Lunaria. Barren branch of frond sessile, situate at the summit of the stipes, linear, obtuse, pinnate: pinnæ three to seven pairs, sessile, flabelliform, with crenate margins, without any median axis of growth, their veins radiating from the sessile base.

Synonymes, Figures, &c.

Osmunda lunaria, *Linn. Sp. Pl.* 1519; *Lightf. Fl. Scot.* 652; *Huds. Fl. Ang.* 449; *Bolt. Fil. Brit.* 4, t. 4; *With. Arr.* 762; *Sm. E. B.* 318.

Botrychium lunaria, *Sm. E. F.* iv. 328; *Mack. Fl. Hib.* 316; *Franc.* 65; *Newm. N. A.* 30, *F.* 337, *Phytol. App.* xxxii.; *Hook. and Arn.* 578; *Bab.* 417; *Moore*, 215.

The figure of this plant in 'English Botany' (E. B. 318), under the name of Osmunda lunaria, gives a correct idea of its appearance.

The genus Botrychium was divided by Swartz from the Linnean genus Osmunda, and has been adopted by nearly all subsequent botanists. The Linnean specific name of lunaria has remained unchanged.

Geographical Range.

The moonwort is found throughout Europe and Asia, extending even into Kamtchatka; and a very similar species, by

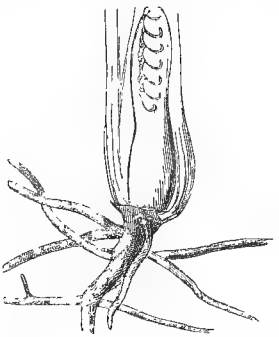
some botanists considered identical, occurs throughout North America.

The moonwort has a very extensive range in Great Britain; but, from its generally diminutive size, it may be said that it frequently escapes that notice which ferns of more conspicuous appearance can by no possibility elude. Its chief stations in England may be given as in Staffordshire, Surrey, and Yorkshire; and Antrim in Ireland: but it is more or less generally distributed over the whole of the British Islands, including the Isles of Wight, Orkney, and Shetland. It affects dry, open, heaths, elevated pastures, and waste lands; its strong succulent roots always creeping horizontally amongst the radicles of grasses. An abnormal station is recorded by that accomplished and amiable botanist, the late Dr. Bromfield, in the 'Phytologist.' "In rocky wooded ground under the cliff at East End, by Luccombe, a little beyond Rose-cliff Cottage, as you go by the pathway to Bonchurch, in the shadiest recesses, amongst dead leaves, June 12, 1841, in moderate quantities. Gathered there since by myself, but the place is difficult to find by strangers: the fern grows in narrow hollows, between the masses of rock overhung by the brushwood."—Phytol. iv. 19. It would be inexcusable in me to publish the immense list of habitats which, through the great kindness of my correspondents, I have received for this fern: they would occupy more space than can be allotted to such a subject.

Description.

The roots and caudex (?) of Botrychium differ essentially from those of true ferns; the roots are stout, succulent, and brittle, and cannot be properly defined as radicles: the caudex (?) is about the same size as the roots, perhaps rather stouter; it descends perpendicularly, and the roots issue from it at right angles, principally at two points, and with a subverticillate arrangement, but without any uniformity in this respect. Before the plant has felt the influence of spring, the frond exists in a quiescent state, but perfectly formed; it then appears like a simple stem, scarcely an inch in length, and perfectly erect: on a closer inspection, the component parts of the future frond

will be clearly perceived; the stipes is swollen, and rather stouter than the upper part, the two branches of which face each other, the fertile branch of the frond being clasped by the barren or leafy part; and, the fructification being thus entirely concealed, the uppermost pinnæ are incurved, as if to give still further protection to the fruit: the whole is invested and completely inclosed in scale-like alternate sheaths, doubtless the decaying stalks of many previous years. As the spring advances the frond rapidly increases in size, until, in April, it makes its appearance above ground, and in May or June attains its perfect development. Mr. Wilson observed, as long ago as 1830, that within the stem of the growing frond, at its base, was inclosed the frond for the ensuing year; and again, within this, also at its base, the frond for the next following year. Mr. Wilson having most kindly communicated to me this very interesting observation, during the following spring I carefully examined an abundant supply of specimens, for which I am indebted to Mr. Hanson, of Reigate; and I am thus enabled to give a magnified figure of one of these future fronds. I find the frond of the ensuing year in every respect perfectly formed; indeed, exactly in the same state in which it is found in the early spring, as above described, but somewhat smaller. The frond for the next following year is less perfectly formed, indeed, its component parts are not to be made out without some difficulty; still it is evidently bifid, the fruitful and leafy portions being already distinct from each other. These observations were made in May, 1843, while the plant was still growing with apparent vigour; so that we have the fronds for three successive years before us at the same time. In the plants I examined, the fronds were placed alternately; that is, having laid all the specimens before me, with the fruit on the right hand, and the leafy portion on the left, then the frond for 1844 invariably had the fruit on the left and the leafy portion on the right: the frond for 1845 appeared to be again reversed, having the fruit on the right and the leafy part on the left.



I must not conclude these observations without acknowledging the obligation I am under to Miss Beever, who, two years subsequently to my receiving Mr. Wilson's letter on the subject, sent me specimens exhibiting the structure here described, and called my attention to many of the particulars I have noticed.

The stipes is very succulent, and rises in an erect position from the sheath-like scales already spoken of, thus totally differing from that of the true ferns: it is divided at about half its length into two branches, one branch bearing the leafy portion of the frond, the other the fructification; the leafy portion is pinnate: the pinnæ vary in number from three to seven pairs, they are somewhat fan-shaped, with their exterior margin slightly crenate; the veins in these pinnæ radiate from the sessile base, and are branched irregularly; they extend almost to the margin, but are never united at their extremities: the fruitful branch of the stipes is pinnate, the pinnæ generally corresponding in number with those of the leafy branch: these lateral branches, or pinnæ, are frequently again divided, and bear a number of nearly globular capsules, which, having attained maturity, open transversely, and, gaping widely, allow the seeds to fall out.

Varieties.

A great number of varieties of this fern have been found, consisting in the greater or less amount of division of the flabellate pinnæ: other aberrations, which may properly be called monstrosities, are also of frequent occurrence, such as having two leafy branches to the frond; two, three, and even four panicles of seeds; and, in some instances, the margins of the pinnæ are changed into seed-vessels. "Many Authours," says Parkinson, "have set forth varieties of the small Moonewort, which because they are but from the Luxuriousnesse of the Plant, in a fertile soyle and accidentall also, not to be found constant, which should make a particular *species*. I have wholly refused to set downe many descriptions of one herbe, but sometime degenerating; let one description therefore serve instead of many."—Park. The. 507.

Culture.

This is the most easy of all ferns to cultivate, never refusing to grow freely if properly treated. First, dig up a large sod, where a few mature fronds are conspicuous amongst the grass; take care to have it broad enough and deep enough, so that not one of the roots of the Botrychium is exposed, much less injured: fit this sod in a large pot, a feeder, or even a box; place it in the open air, and be sure to add no compost, or rich vegetable soil. Keep the grass cut short with a pair of scissors, and water in dry weather, for the purpose of keeping the grass green and vigorous. Acting on the belief that Botrychium is a root-parasite, the only requisite is to keep the nurse-plant in vigorous health.

Economical Uses.

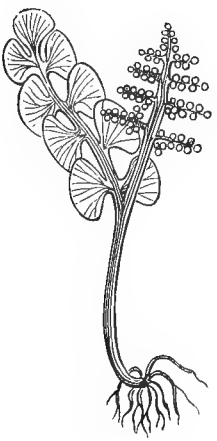
It is rather amusing than instructive to read of the virtues ascribed by Dioscorides, and other ancient writers, to nearly the whole family of ferns. Of the present species much has been written, and the most wonderful magical properties have been assigned to it. This we may trace, in a great measure, to the singular form of the pinnæ: all those plants whose leaves bore even a fancied resemblance to the moon — and the name clearly implies that this was the case in the present instance — were formerly regarded with a most superstitious veneration. From all record we find that they were to be gathered by the light of the full moon, or half their powers would be lost. In the present day, such fancies are entirely confined to poesy.

> "Then rapidly, with foot as light
> As the young musk roe's, out she flew,
> To cull each shining leaf that grew
> *Beneath the moonlight's hallowing beams.*"

And again: —

> "The first leet night *quhan the new moon set*,
> Quhan all was douffe and mirk,
> We saddled our naigis *wi the moon fern leif*
> And rode fra Kilmenin kirk."

Gerarde says, "it is singular to heale green and fresh wounds: * * * it hath been vsed among the Alchymists and witches to doe wonders withall, who say that it will loose lockes, and make them to fall from the feet of horses that grase where it doth grow, and hath been called of them Martagon; whereas in truth they are all but drowsie dreames and illusions; but it is singular for wounds as aforesaid,"—Ger. Em. 407. Both Gerarde and Ray (Raii Syn. 128) speak of its virtues as a remedy for dysentery. Parkinson adds that "some Alhymists also in former times have wonderfull extolled it to condensate or convert Quicksilver into pure silver, but all these tales were but the breath of idle headed persons, which divers to their cost and losse of time and labour have found true, and and now are vanished away with them, like the air or smoake therein."—Park. The. 508.



† RUE-LEAVED MOONWORT.

Characters.

Genus.—Botrychium. (See page 313).

Species.—Rutaceum. Barren branch of the frond shortly stalked, situate at the summit of the stipes, deltoid, pinnatipartite: pinnæ linear, three or four pairs, pinnatifid; ultimate divisions bifid or trifid: the pinnæ have a median axis of growth, their veins never radiating from the base.

Synonymes, &c.

Botrychium rutaceum, *Swartz, Syn. Fil.* 171; *Willd. Sp. Pl.* v. 62; *Mart. Fl. Mosc.* 183; *Ledeb. Flor. Ross.* xiv. 505; *Newm. Phytol.* v. 129.

Botrychium matricariæfolium, *Al. Braun, in Koch, Syn.* 2nd edit. p. 972; *Fries, Summa Veg. Scand.* 252; *Döll, Rhen. Flor.* 43.

Botrychium lunaria, δ., *Sm. E. F.* iv. 328.

Botrychium matricarifolium, *Woods, Tourist's Flora,* 426.

It seems desirable to exclude the following synonymes, all of which belong to a second species, for a specimen of which I am indebted to Mr. Watson.

Botrychium matricarioides, *Willd. Sp. Plant.* v. 62; "*Fries, Summa,* 83, *Novit.* ed. 2, p. 288;" *Ledeb. Fl. Ross.* xiv. 505.

Botrychium rutaceum, *Wahl. Fl. Suec.* 681.

Botrychium Matricariæ, *Sprengel, Syst. Veg.* iv. 23.

Botrychium Rutæfolium, *Al. Braun, in Koch, Syn.* ed. 2, p. 972.

Botrychium Rutifolium, *Woods, Tourist's Flora,* 426.

Having, through the kindness of Professor Al. Braun, received authentic German specimens of Botrychium rutaceum, I can with certainty cite that author's synonyme: the only question that remains open is, whether Willdenow is correct in his

application of Swartz's earlier name of rutaceum: for my part, I entirely agree with Willdenow's decision on this subject, for there is nothing in Swartz's brief description at all at variance with Willdenow's plant. The distinction between the two may be very briefly stated. In the plant now under consideration, and which I call rutaceum, the stipes is long, and undivided nearly to its summit, as in lunaria. In matricarioides the barren branch is given off at the base, the stalk of the panicle having the appearance of the stipes of the frond. Again, in rutaceum, the pinnæ are linear or sublinear; in matricarioides they are deltoid, and the whole barren branch closely resembles the leaf of Anemone nemorosa.

Botrychium rutaceum is the "Lunaria minor foliis dissectis" of Ray, (Raii Syn. 129). It will be seen by a reference to the 3rd edition of the 'Synopsis,' that Lawson thought the plant a variety of B. lunaria, but that Dillenius, the able editor, rejects the idea as untenable. Sir J. E. Smith makes it a variety, without hesitation: and the learned authors of the 'British Flora,' and of the 'Manual of British Botany,' do not notice its existence.

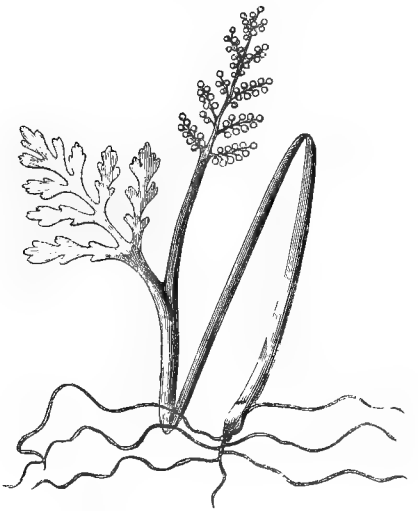
Geographical Range.

Botrychium rutaceum is found in all the northern countries of Europe and Asia; and a very similar species occurs in North America.

In this country, Smith speaks of it as found occasionally, intermixed with plants of the common form. Ray gives Westmoreland as a county where it occurs; and says that Doody received his specimen from Sir Thomas Willughby, "but hath since seen it several times gathered by our herb-women." Mr. Cruickshank says, in a note:—"I found it on the Sands of Barry, near Dundee, in August, 1839. I observed but three specimens, all of them exactly alike, excepting a small difference in size, and I could find none of the common form of the plant growing near them." Mr. Cruickshank sent me a drawing, which I did not at the time recognise as representing the present species: a carefully accurate engraving of this will be found at page 324.

Description.

Roots large, succulent, unbranched, extending horizontally from the root-like caudex amongst the radicles of grasses, which, in the German specimens I have received, through the kindness of Professor Braun and Dr. Caspary, adhere to them in great numbers. Stipes branched near its summit: the barren branch shortly stipitate, deltoid, pinnate or pinnatipartite: the pinnæ linear, pinnatifid, and having a distinct midvein, or median axis of growth; ultimate divisions bifid or trifid.



Botrychium rutaceum, (*natural size*).

Looking at the above figure, drawn from a specimen kindly given me by Professor Braun, and representing, with tolerable fidelity, the normal state of a very common European Botrychium; recollecting that this is certainly the plant freely admitted by Ray and Smith as British; and comparing it with the figure of B. lunaria at page 313; it becomes desirable to consider whether it ought to receive the rank and name of a species. I confess, that I have no prejudice in favour of either course: it affords another of those instances in which our

continental neighbours,—more familiar with the plant than ourselves, having more materials than ourselves, and having devoted more attention to the subject than ourselves, — arrive at and maintain an opinion which we are not fully prepared to adopt. On making the comparison in question, and confining it strictly to the barren branch, it does not seem to me that we are justified in saying that one form is a modification of the other; that the linear pinnate leaf at page 313, would, by a greater or less amount of cutting or subdivision, or by a greater or less amount of luxuriance, become, or even approach, the deltoid but equally simple leaf at page 322. It happens that a divided form of B. lunaria is not uncommon; but in this, the flabelliform pinnæ are split to the base, becoming completely digitate, and thus receding still more from the habit and characters of rutaceum.

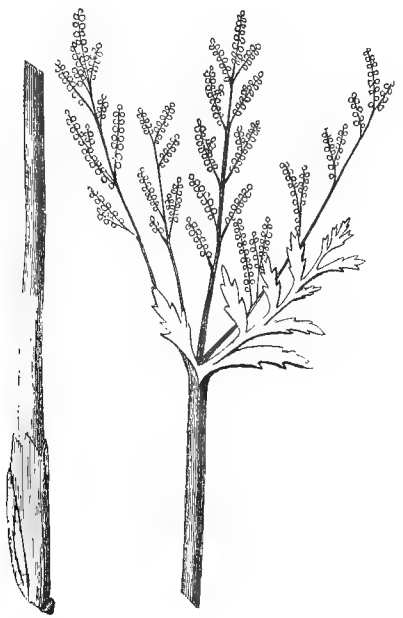
Varieties.

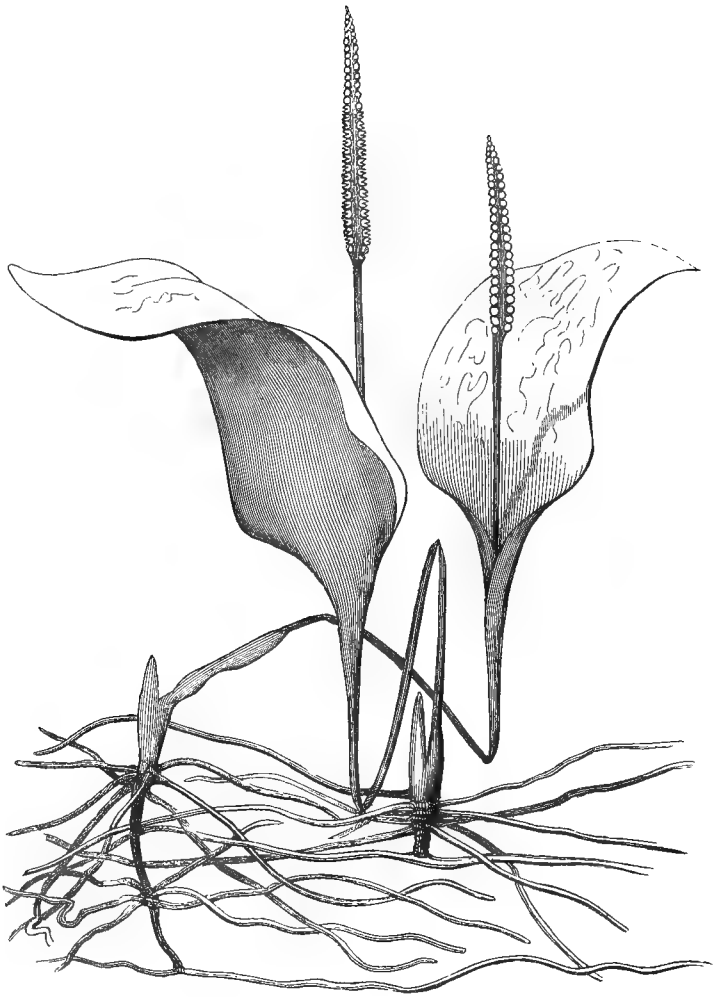
The varieties of this fern very much favour the idea of its being specifically distinct from B. lunaria. If we regard discrepancies in size as varieties, then are they most abundant: if we regard discrepancies in the amount of division as varieties, then also are they most abundant. I have felt great interest in examining and comparing the barren branches of a series of these ferns: sometimes they are so small as readily to escape notice unless sought for, and appear as a green scale, less than the eighth of an inch in length and breadth, and scarcely even undulated at the margins: from this almost rudimentary state we may trace them up to the fully developed and divided form which I have figured on the opposite page; and this, again, is probably not by any means an unusually luxuriant or developed specimen. Now, through all these gradations of size and discrepancies of division, there is no approach to the cognate species; on the contrary, the characteristic outline is most faithfully preserved. There is, moreover, in this species, in common with its congener, a great tendency to malformation or multiplication of parts; thus, fronds with two or three fertile branches are by no means uncommon, and, in some instances, as in the example figured by Mr. Cruickshank overleaf,

I have even seen four: it was, indeed, this circumstance, and the evidence thus unequivocally afforded of the malformation of that individual specimen, that induced me to reject it as a species. Even at the present moment, I should consider such a malformed example as totally to be ignored in studying a species, were it not, *first*, that I now know the typical state of the plant from which that example is a mere aberration; and, *secondly*, that such aberrations occur in cognate species, and demonstrate the fact that the species of the genus are peculiarly subject to these freaks of Nature.

Culture.

No attempt has ever been made in this country to bring Botrychium rutaceum under cultivation.





ADDER'S TONGUE, (*natural size*).

Characters.

Genus.—Ophioglossum. Frond produced annually *exterior to* the base of the last year's frond: exterior or barren branch a simple undivided spathe; interior or fertile branch a simple, erect, stalked, pointed spike, in the substance of which two parallel series of large spherical capsules are embedded; these open by a transverse fissure, giving to the spike a serrated appearance.

Species.—Vulgatum. Stipes erect: fertile branch of frond an erect, club-shaped, pointed spike; the barren branch an entire ovato-lanceolate leaf.

Synonymes, Figures, &c.

Ophioglossum vulgatum, *Linn. Sp. Pl.* 1518; *Lightf. Fl. Scot.* 651; *Huds. Fl. Ang.* 449; *Bolt. Fil. Brit.* 2, t. 3; *With. Arr.* 761; *Sm. E. F.* iv. 330, *E. B.* 108; *Mack. Fl. Hib.* 346; *Franc.* 66; *Newm. N. A.* 30, *F.* 349, *Phytol. App.* xxxii.; *Hook. and Arn.* 578; *Bab.* 417; *Moore*, 218.

There are faithful figures of this plant in Gerarde (Ger. Em. 404), Bolton (Fil. t. 3), and 'English Botany' (E. B. 108).

All modern botanists appear to be agreed as to the name of Ophioglossum vulgatum.

Geographical Range.

The adder's tongue is a common plant on the continent of Europe, and it is said to occur in almost every part of the world; but I have been unable to satisfy myself as to the identity or otherwise of the species.

It is generally distributed over England, and in many places is very abundant, covering acres of meadow-land, and being considered highly injurious to the crop of grass, not only on account of its being disliked by cattle generally, but from its

depauperating effect on the grass, upon which it acts as a root-parasite, although the actual parasitism has never been traced. In Wales, Scotland, and Ireland, the plant is of less common occurrence, a circumstance perhaps attributable to the greater frequency in England of those low loamy pastures which it peculiarly affects. I have only on one occasion found it in a wood, and this was on the northern slope of West Hope hill, in Herefordshire; here it was large and luxuriant, the apex of the frond elegantly turning back, and its appearance somewhat resembling that of the blossom of the Egyptian Arum. In Berrington Park, in the same county, it occurs in the utmost profusion; and from these stations I obtained the specimens from which I drew the figures at page 325. In reference to Ireland, the late Mr. Thompson observed of Ophioglossum: — "Templeton remarks that it is partial to moist loamy or clay soils, especially meadows liable to be flooded after heavy rains: he particularises a locality of this nature on the banks of the river Logan, about three miles from Belfast." Mr. Thompson, in company with Mr. Ball, found the adder's tongue in the South Isles of Arran, off Galway.

Description.

The roots and rhizome of adder's tongue much resemble those of moonwort; but the rudimentary plant for the next year is exterior to the stem, and not inclosed within it, as in the latter; a reference to the figure at page 325 will elucidate this: the caudex (?) descends to a certain but not uniform distance, emitting at right angles various lateral, stout, succulent and brittle roots; the arrangement of these lateral branches is somewhat verticillate; at the lower extremity of the caudex I have invariably found a single horizontal root, of very considerable length, often as much as ten inches: I have procured large pieces of turf filled with these plants and their roots, and have carefully removed the earth, expecting to find a connexion between the plants by means of these horizontal roots: yet, though I constantly found them in contact, I never detected anything like union, but those of the upper series are frequently attached to the radicles of the grasses among which

they grow. The detached external bud at the base of the stem contains the frond for the ensuing year, in a perfectly erect position, and having the leafy part of the frond wrapped round the spike of fructification. The frond comes above ground in May, still retaining its erect position; it is composed of a long, smooth, pale-coloured, succulent stipes, an ovate, rather acute, slanting, deep green leaf, and a straight erect spike, issuing from within the base of the leaf: the leaf is traversed in every direction by irregular anastomosing veins. The spike is distinctly stalked, the stalk being sometimes three or four inches in length, but generally scarcely more than one inch: the spike itself is rather stouter at the base, very gradually tapering to the apex; it is composed of two series of large, imbedded, crowded capsules; these capsules appear to be spherical cavities, filled with a pollen-like dust: when mature, each capsule opens by a transverse fissure, the pollen-like dust escapes, and the lips of the capsules remain separate and gaping.

Varieties.

Instances of monstrosities occur, in which two, three, four, five, and even six spikes issue from a single leaf.

Culture.

The adder's tongue, in order to succeed well in a garden or pot, must be removed with a large sod of the herbage amongst which it is found. If its connexion with the herbage, of whatever nature this may be, is once disturbed, it is extremely difficult to get the plant to grow: it may perhaps live out the usual duration of the frond, but will be almost sure to be found wanting when looked for during the ensuing spring.

Most cultivators consider this genus, like Botrychium, perfectly unmanageable. But this need no longer be the case: and it will be a boon to science if any one will attentively study both genera under cultivation, keeping in mind the conditions indispensibly essential to success. *First*, dig up the plants when perfectly mature, and with every particle of their

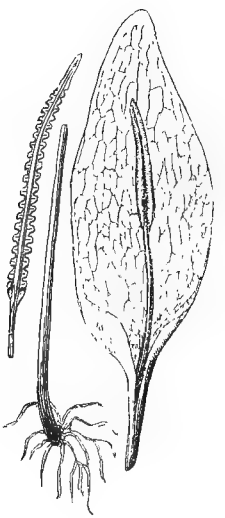
roots intact: *secondly*, leave the grass or accompanying herbage of whatever kind, undisturbed: *thirdly*, let the soil, whether hungry, as in Botrychium, or loamy, as in Ophioglossum, in which the plant is found growing, be the only compost allowed near it: and, *lastly*, cultivate the herbage or foster plant *only*, every effort being directed to keep that in vigorous health.

Economical Uses.

The *virtues* of adder's tongue are not quite so numerous as one might expect from its name and singular appearance. Gerarde, Ray, and Lightfoot extol its healing powers, the two former in oil, the latter as an ointment. "Adder's tongue," says Gerarde, "is dry in the third degree. The leaves of Adder's tongue, stamped in a stone mortar, and boiled in Oyle Oliue vnto the consumption of the juice, and vntill the herbes be dry and parched, and then strained, will yeeld a most excellent greene oyle, or rather a balsame for greene wounds, comparable to oile of St. John's-wort, if it do not farre surpasse it by many degrees; whose beauty is such that very many artists haue thought the same to be mixed with verdigrease." — Ger. Em. 405. Lightfoot says the common people in Scotland "sometimes make an ointment of the fresh leaves, and use it as a vulnerary to green wounds," (Fl. Scot. ii. 652): and Mr. Luxford informs me that it is still gathered for the same purpose in some parts of Surrey and Sussex, and used under the name of "adder's-spear ointment." Miss Atwood, of Clifton Vale, Bristol, informs me that "in a part of Herefordshire, which is quite on the borders of Worcestershire, and in the parish of Whitbourne, the country people in the spring make what they call 'May ointment,' one of the ingredients in it being the adder's tongue fern. It grows plentifully in a meadow in that district, and has been long in use as an important part of the ointment, which is composed of a variety of herbs, and is reckoned a panacea for bruises, tumours, &c. The leaves and stems are the parts used of the Ophioglossum." — Phytol. iv. 1098. I have received similar information from a great number of authentic sources; and Mr. Francis says "it is gathered for this purpose by basketsful; for, be it observed,

that in some parts of England it is almost as abundant as the herbage amongst which it grows." — Anal. 66. Dr. Lindley, writing of the Ophioglossaceæ, says : — " The herbage is mucilaginous, whence the species have been employed in broths. Ophioglossum vulgatum and Lunaria botryoides have been used in medicine as vulneraries, but they seem to possess that quality as little as the magical virtues once ascribed to them. Helminthostachys dulcis is regarded in the Moluccas as a slight aperient, is used as a pot-herb, and its young shoots as asparagus. The Haytians fancy Botrychium cicutarium to be an alexipharmic." — V. K. 77. From Dr. Lauder Lindsay's paper, already so frequently quoted, it would appear that it is of no account with medical men of the present day. However, notwithstanding this neglect on the part of the profession, we find that a poet has embalmed its curative powers in immortal verse : —

> " For them that are with newts or snakes or adders stung,
> He seeking out an herb that's called Adder's-tongue,
> As Nature it ordain'd, its own like hurt to cure,
> And sportive did herself to niceties inure."



PIGMY ADDER'S TONGUE, (*natural size*).

Characters.

Genus.—OPHIOGLOSSUM. (See page 326).

Species.—LUSITANICUM. Caudex elongate, ovate, descending perpendicularly: roots succulent, spreading horizontally amongst the radicles of grasses: barren branch of the frond narrow, linear, sometimes lanceolate, obtuse: fertile branch club-shaped.

Synonymes, Figures, &c.

Ophioglossum lusitanicum, *Linn. Sp. Pl.* 1518; *Swartz, Syn. Fil.* 169; *Willd. Sp. Pl.* v. 59; *Woods, Tourist's Flora,* 426; *Lindley, Veg. Kingd.* 77; *Newm. Phytol.* v. 80.

Geographical Range.

This curious little fern is so connected with the commoner species — Ophioglossum vulgatum — by means of a series of plants, intermediate in size, and in the configuration of the barren portion of the frond, that it is extremely difficult to determine to which species the recorded habitats refer: whether such intermediate plants really constitute intermediate species, and whether or no they serve to unite the extremes in either direction, and thus prove that vulgatum and lusitanicum are nothing more than extreme states of a single species, I will not attempt to decide. Such intermediate plants exist chiefly in the Atlantic islands: Mr. Watson has such from San Miguel, Madeira, &c.; and Dr. Hooker has kindly presented me with others from New Zealand, which I am unable to separate with confidence either from vulgatum or from lusitanicum. It is abundant in some parts of Portugal, Spain, France, Italy, and Greece; it occurs in several islands of the Mediterranean; and through the kindness of my lamented friend, Col. Bory de St. Vincent, I possess specimens from Algeria. Mr. Watson, who has most kindly given me copies of his labels, has specimens of the true lusitanicum from San Miguel and Teneriffe.

For its discovery in the British Isles, we are indebted to Mr. George Wolsey, who kindly sent me the following information for publication in the 'Phytologist.' He "found it in some abundance amidst short and very level herbage sloping towards the South, on the summit of rocks, not far from Petit Bot Bay, on the south coast of the Island of Guernsey. On this elevated down are a few scattered and stunted furze-bushes, and around these the grass is, as usual, somewhat longer, and here the little adder's tongue is not quite so minute as on the level turf, where it scarcely attains an inch in height. It grows in company with Trichonema Columnæ and Scilla autumnalis, and on the 17th of January, 1824, was in full fruit. The very early fructification, and the minute size of this species, while it at once indicates the cause of its having so long escaped unobserved in Guernsey, suggests the idea that it may also have been overlooked in similar situations in the south-western counties of England and Ireland." — Phytol. v. 81. I am much indebted

to Mr. Wolsey for the kind and prompt manner in which he gave me every information respecting this fern, and liberally supplied me with specimens, both living and dried.

Description.

The roots are large in proportion to the size of the plant; they are brittle, succulent, and spread horizontally amongst the radicles of the herbage, from a somewhat elongate-ovate perpendicular caudex: from the crown of this caudex, accompanied by a few scarcely perceptible, withered, scale-like spathes, rises an erect stipes, which, in all my specimens, is divided below the surface of the soil into a barren and a fertile branch: the barren branch is generally linear, but sometimes lanceolate, and always obtuse at the apex; in one specimen, represented in the middle figure at page 331, there are two barren branches, the lower decidedly lanceolate, the upper, decidedly linear; in a second specimen, represented in the left-hand figure, the barren frond is truncated, or cut off, as it were, at half its length, and the upper portion replaced by three dehiscing capsules in a row: the fertile branch rises in a perfectly erect position, and is composed of a delicate stipes, which is very slender at its base, and gradually incrassated upwards, until it terminates in a sublinear, or, perhaps, rather subobclavate apiculate spike, which is composed of a fleshy central column, and two series of imbedded capsules, which have a spherical internal cavity: exteriorly they are amorphous, but, dehiscing transversely, exhibit themselves very conspicuously. The entire plant is very small; the figures represent it of the exact size, the middle one of a large individual, the others of the ordinary size.

In raising the question whether this be a species distinct from vulgatum, we have to look at other circumstances besides its confessedly similar appearance, and the existence of intermediate forms. In the first place, let us glance at the very unattractive, and somewhat unbotanical, character of magnitude. The metropolis of this fern may perhaps be the Atlantic islands, but it also occurs abundantly on the shores and islands of the Mediterranean, in Greece, Italy, France, Spain,

and Portugal: now the tendency of these countries is to develope the growth of small British ferns: it is almost invariably the case that our ferns grow out of knowledge, and receive new names, in these more favoured climes. Asplenium Trichomanes, A. Adiantum-nigrum, and Notolepeum Ceterach, are familiar instances, and show that British ferns, under such altered conditions, do not become depauperated. Then, as to period of mature fructification: lusitanicum has reached perfection by the middle of January, vulgatum by the middle of June: this is a very marked discrepancy. The question of identity is well worth entertaining, but it is also one that must be treated with the greatest caution, and the utmost singleness of purpose, truth being steadily kept in view, as the only desideratum.

Varieties.

The varieties, so to call them, have been already noticed: some individuals have two barren branches, or leaves, instead of one, in which case the exterior or lower one is lanceolate, the interior or upper one linear. The conversion of the apex of a leaf into capsules must be regarded rather as a morphological monstrosity than a variety.

Culture.

Mr. Wolsey, not being aware of the probably parasitical nature of the Ophioglossaceæ, has taken great care to free the roots of his plants from the surrounding grasses: I have never seen living botanical specimens more delicately extricated from the surrounding fibres, or more perfectly free from all injury, and my plants still look healthy, though I much doubt whether I shall find them making a second appearance above the surface of the soil.

Preservation for the Herbarium.

Under each species I have given an account of the best mode of cultivation, but I have said nothing of preserving specimens for the herbarium. In the first place, I would observe that all specimens selected for preservation should be as perfect as possible. Let no one imagine that a portion of a frond, or an immature frond, or the frond of a seedling plant, or a deformed frond, or a frond in any respect monstrous or abnormal, can fairly represent a species. I regret to find a necessity for making the observation, that the majority of herbarium specimens which I have seen are, from one cause or other, untrue representatives of the species. From indulging a disposition to collect the *curious*, we are too apt to fall into the great error of neglecting the simply *true*. When practicable, fronds, caudex or rhizome, and radicles should be preserved; but, if this be impracticable, at least have the frond entire, from the extreme apex to the extreme base of the stipes, taking especial care that none of the scales be removed. Colour is a grand desideratum, and can only be retained by the use of Bentall's paper. I have taken great pains to introduce this paper among botanists, and have invariably found them delighted with the result. Indeed, I do not hesitate to say, that before this paper was made there were *no* well-preserved collections of ferns, and now there are very few badly preserved. There should be a sufficiency of paper used to avoid too frequent changing; but I have always found it desirable to make the first pressure a very light one, and of short duration, because any alteration in the arrangement of the divisions of the fronds are readily accomplished whilst still flexile. No change takes place in the most delicate tints, if two sets of paper are used, one drying while the other is in the press.

Conclusion.

I must not conclude this work without expressing my most sincere thanks to all who have aided me with their advice and information. In a series of communications, spread over the ten years which have elapsed since the publication of the second edition, it is not improbable that some have escaped notice; and when this is the case I trust to be forgiven, seeing that my own is the loss. Very many, recording that a frond has been found divided at the apex, or some such deviation from the ordinary mode of growth, I have thought it scarcely consistent with my plan to print. I could wish that fern-gatherers would give less attention to such deviations, and more to the discovery and discrimination of species. What a field is open for this in Scotland! The rare and rapid visits of our Wilsons, Watsons, and Backhouses, have made known two Woodsias, a Cystopteris, and two Pseudathyriums: four or five Botrychiums, Onoclea Struthiopteris, Athyrium deltoideum, Lycopodium complanatum, and several other North-European species, will doubtless reward the future explorer.

The pages of the 'Phytologist' have frequently been drawn on for the detail of habitats: but want of space has compelled me to be much more sparing in my quotations than I could have wished. As a repository of fern-lore, that journal appears absolutely inexhaustible.

I may add, that I shall at all times be extremely obliged for specimens of European ferns: we may regard them all as possible, many as probable, inhabitants of Britain; and a British pteridologist should be perfectly familiar with them.

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